FIG. 1

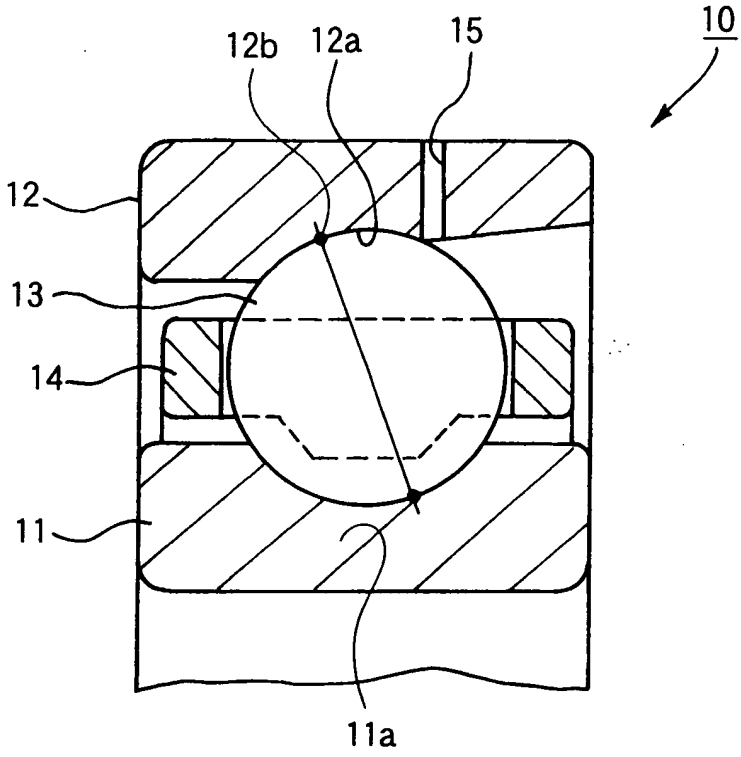


FIG. 2

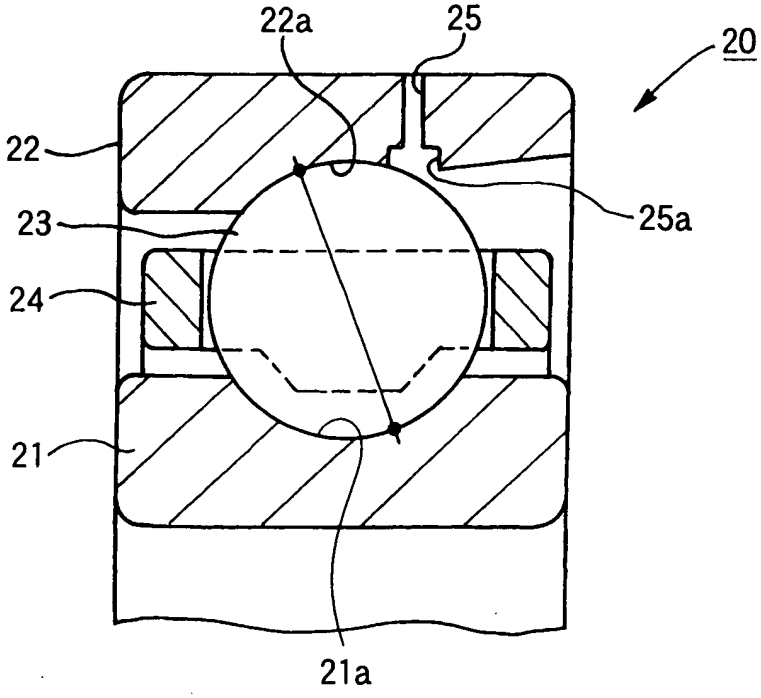


FIG. 3

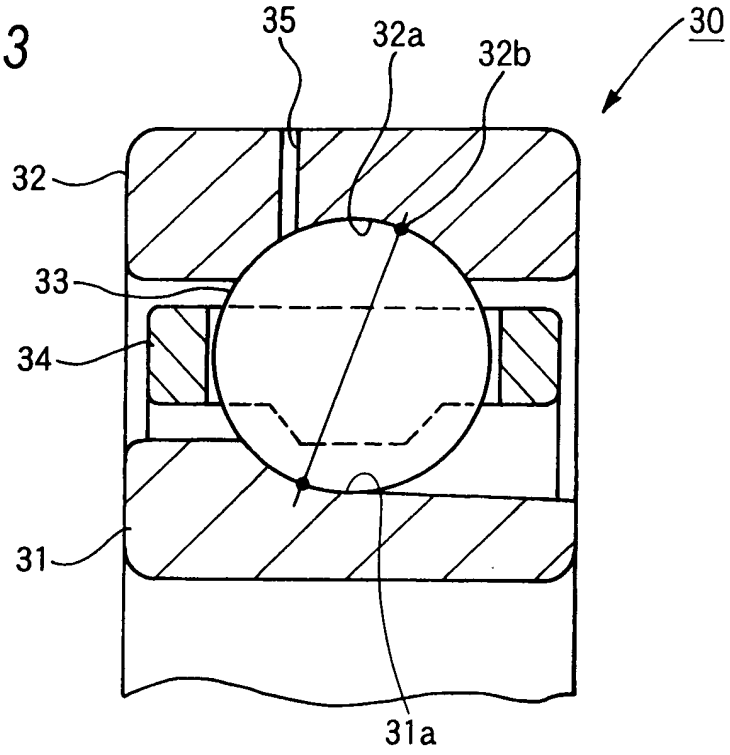


FIG. 4

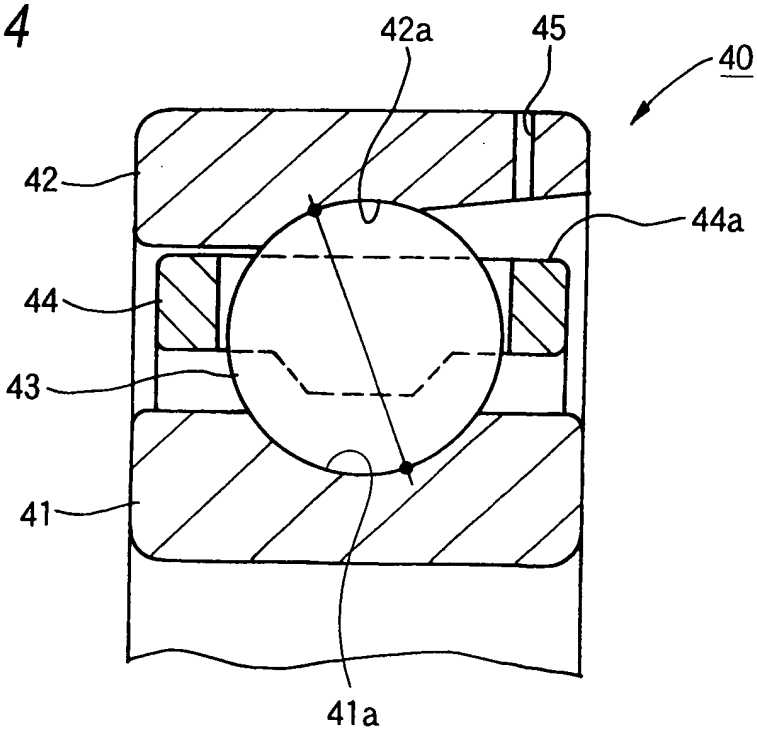


FIG. 5

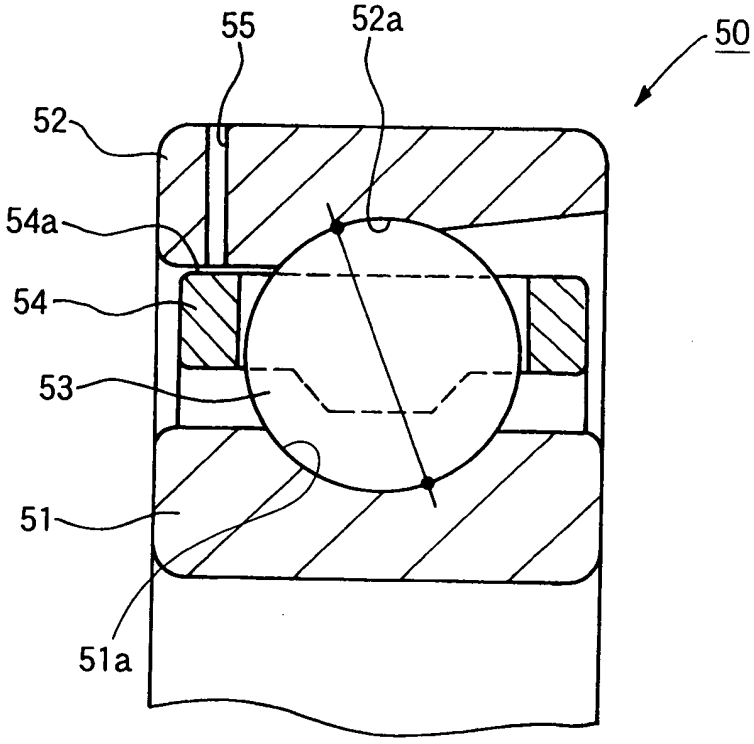


FIG. 6

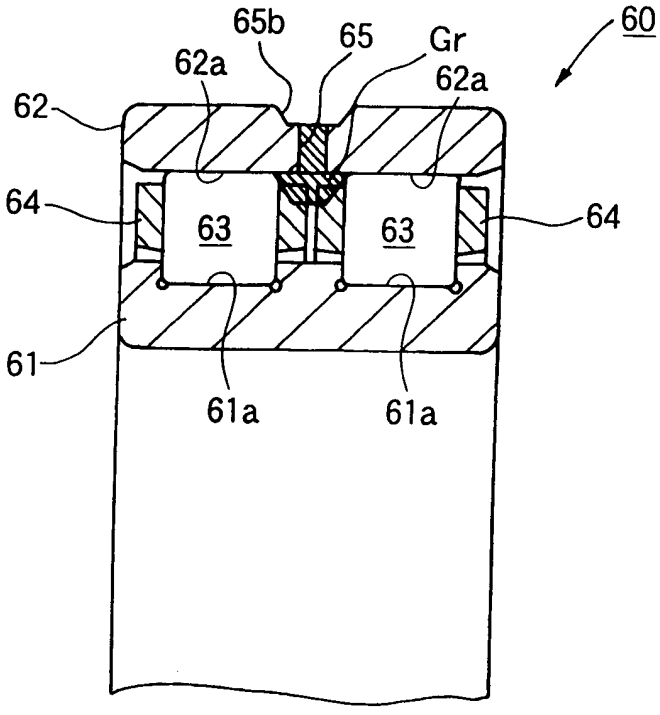


FIG. 7

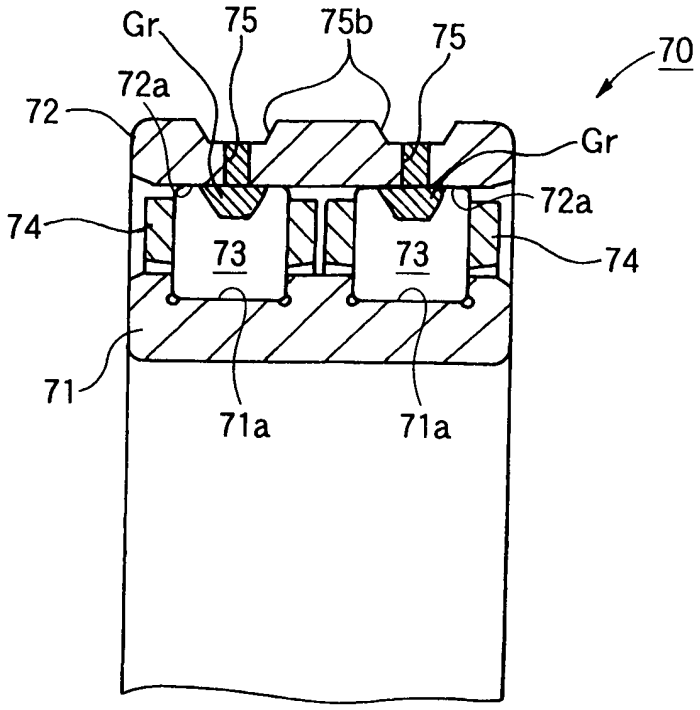


FIG. 8

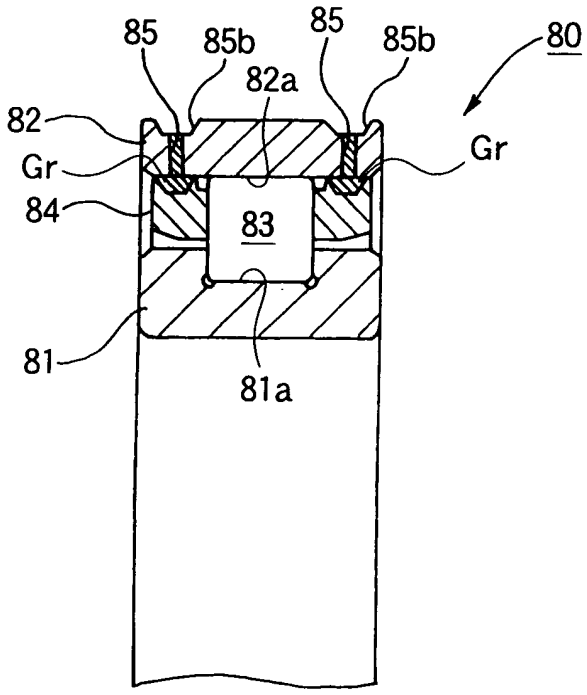


FIG. 9

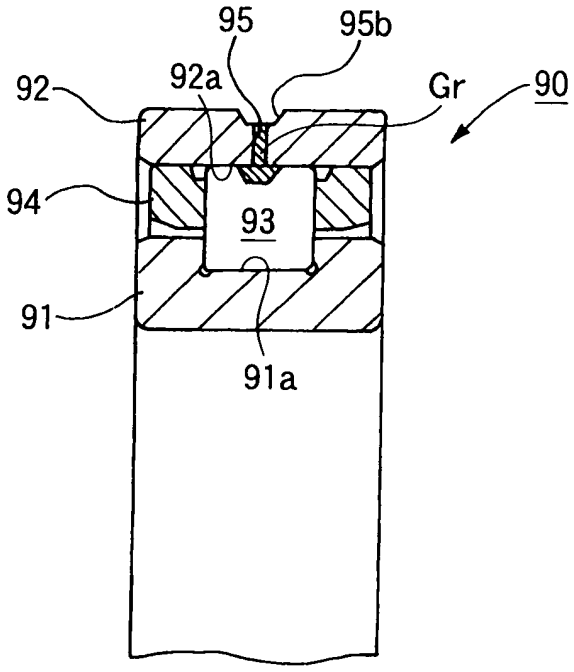


FIG. 10

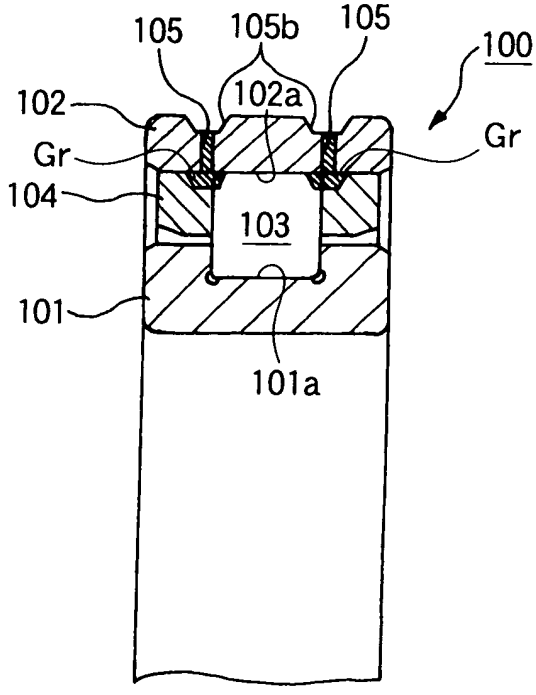


FIG. 11

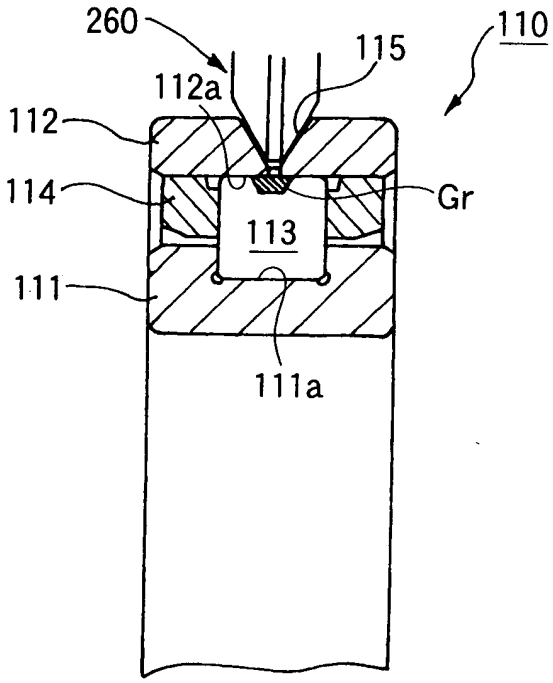


FIG. 12

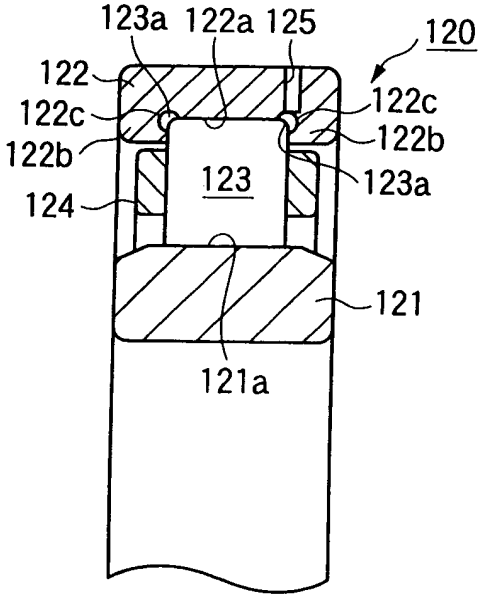


FIG. 13

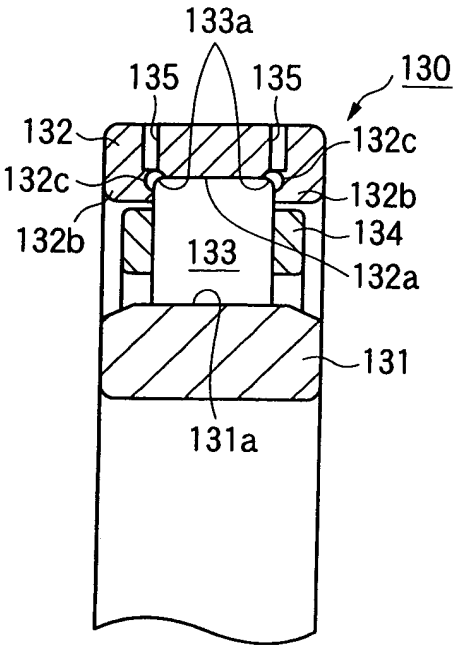


FIG. 14

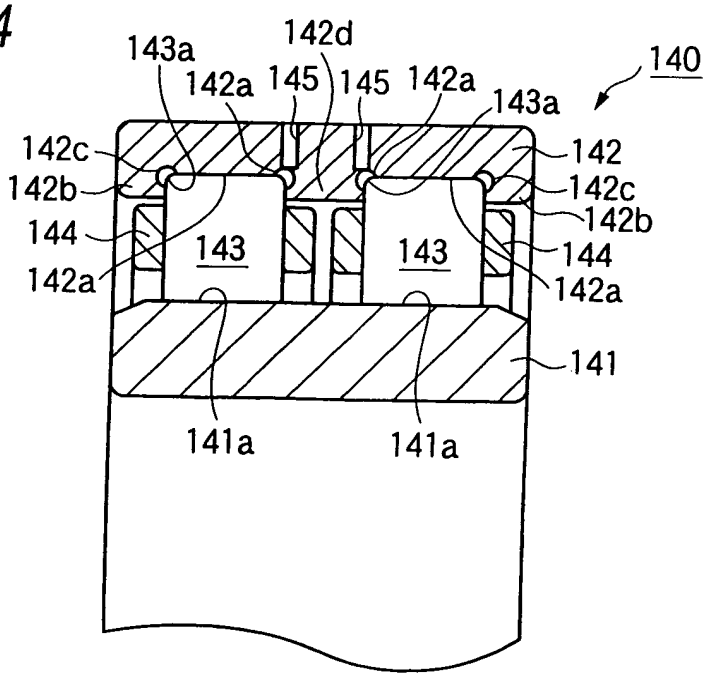


FIG. 15

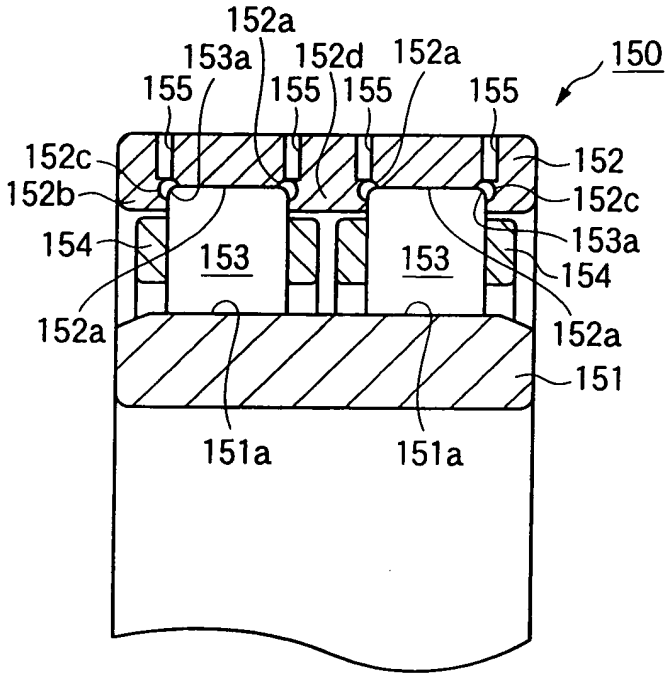


FIG. 16

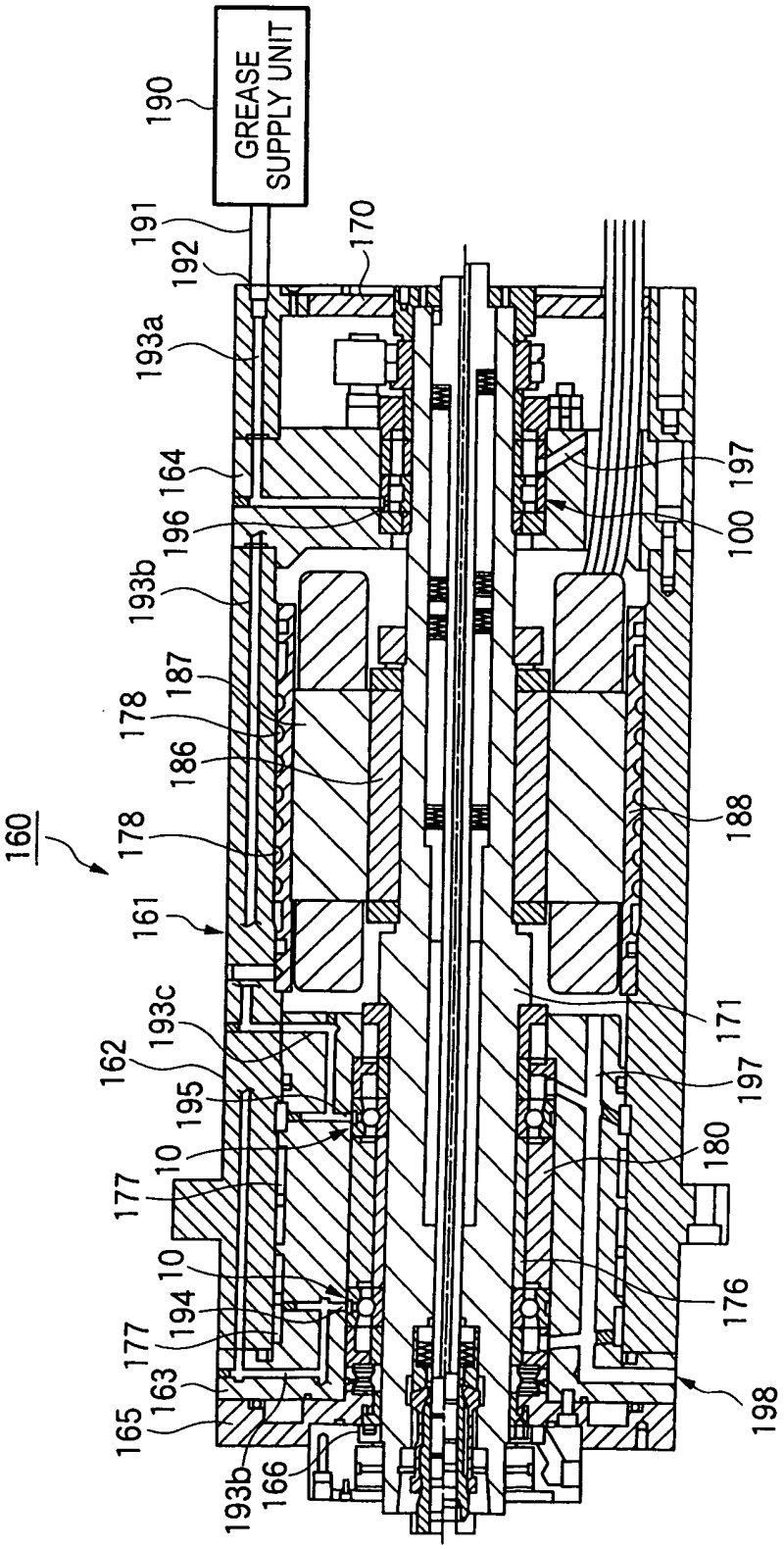


FIG. 17

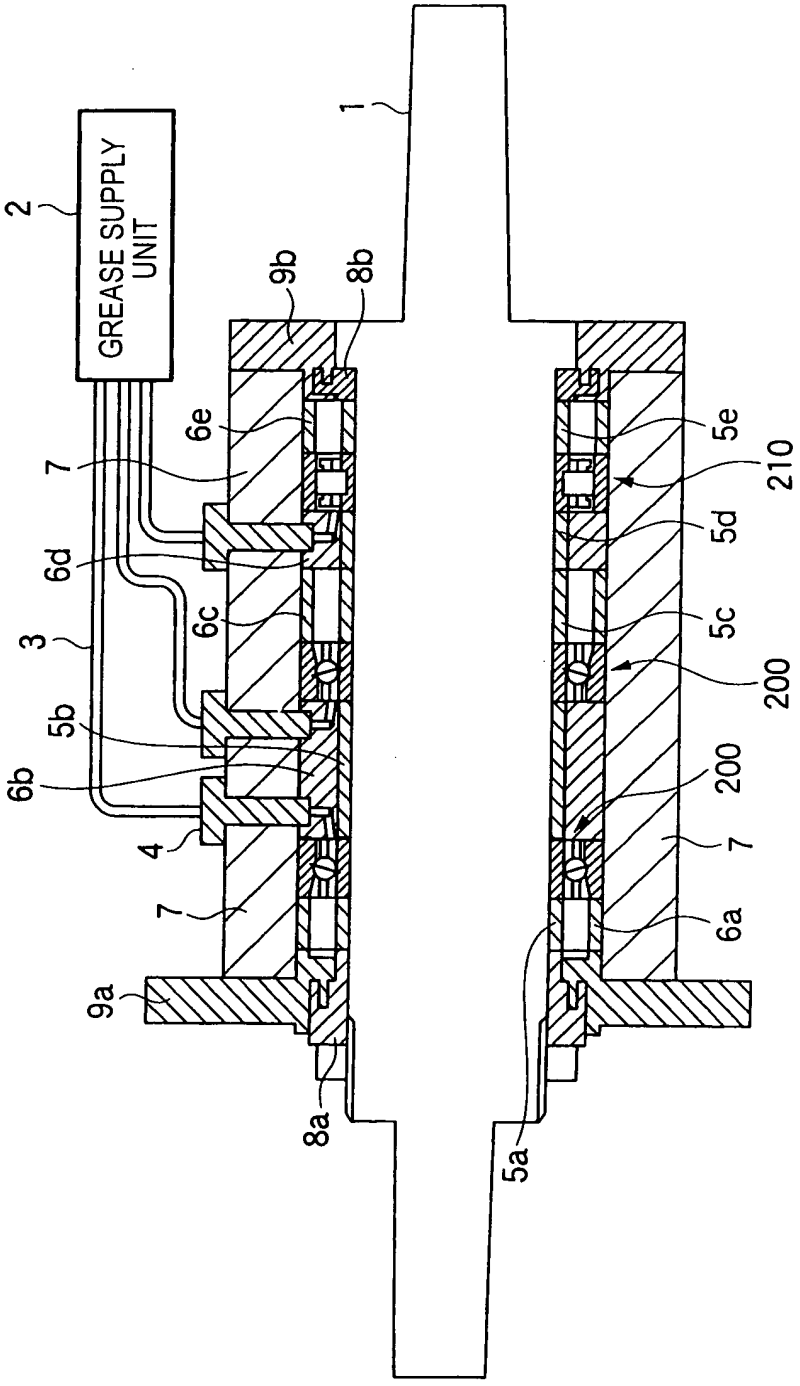


FIG. 18

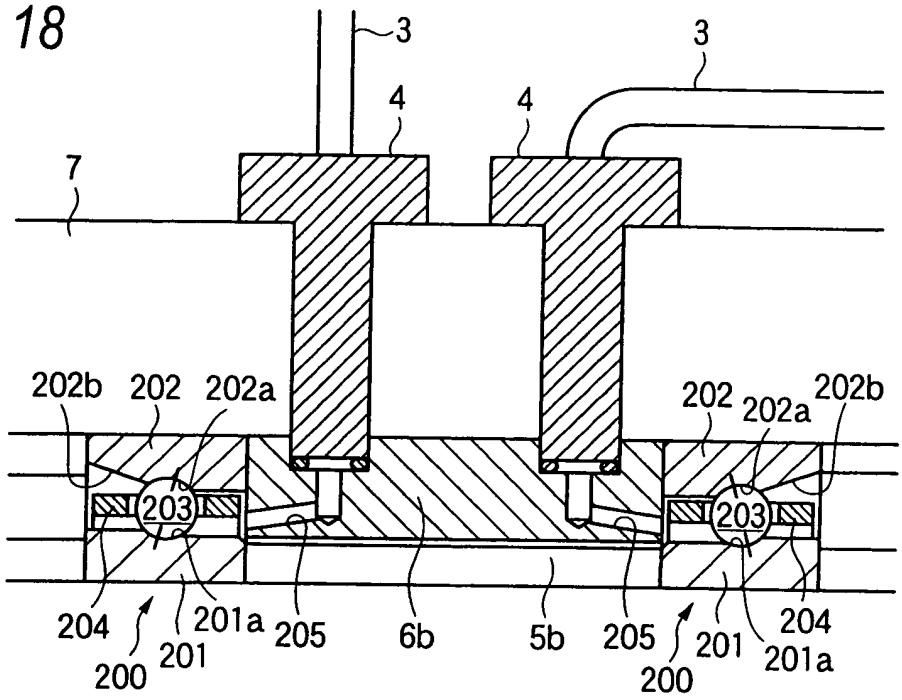


FIG. 19

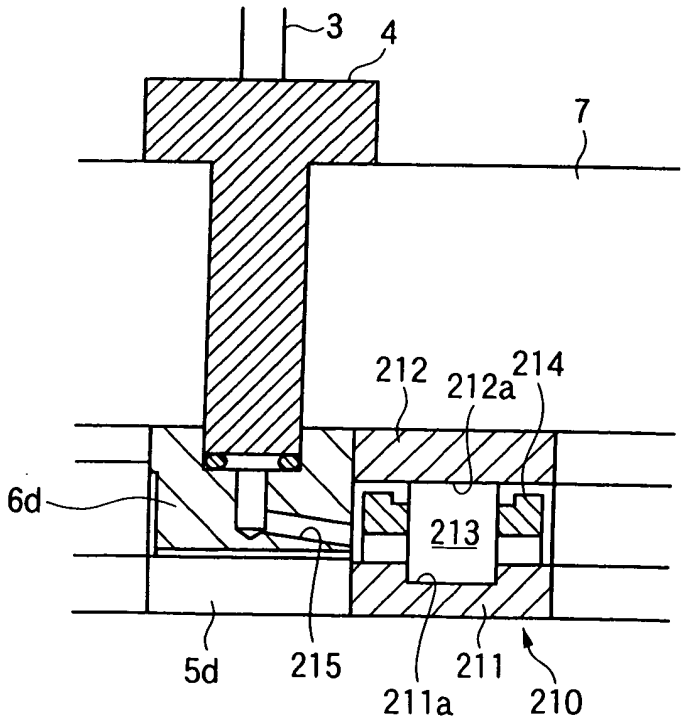
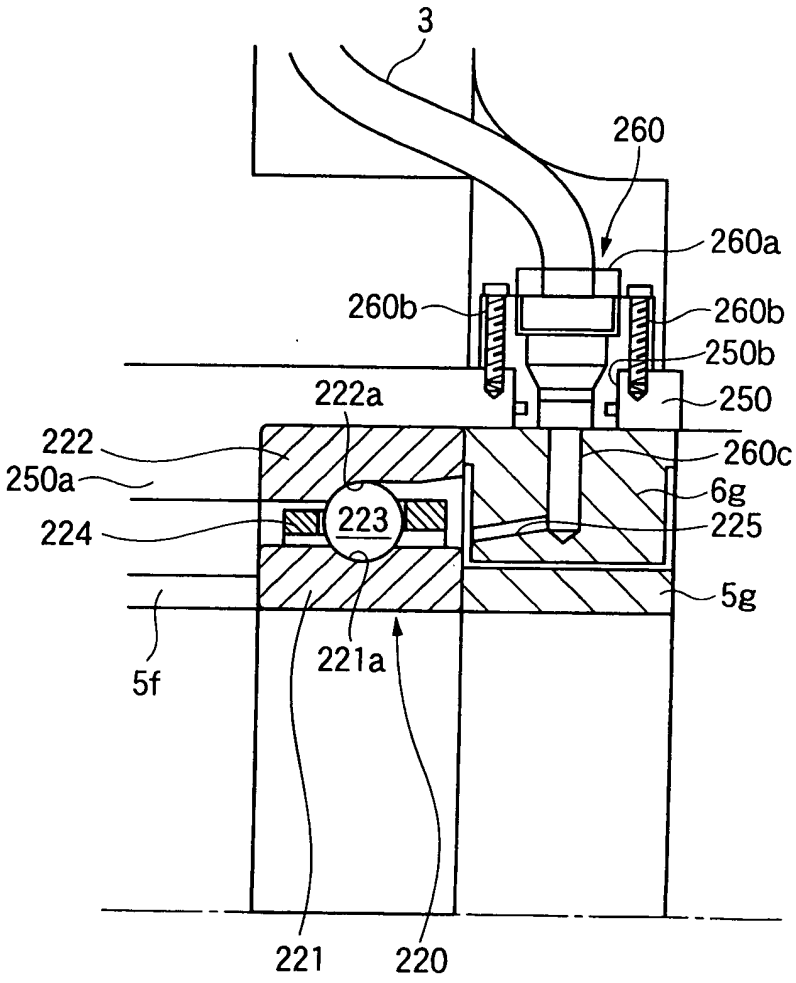


FIG. 20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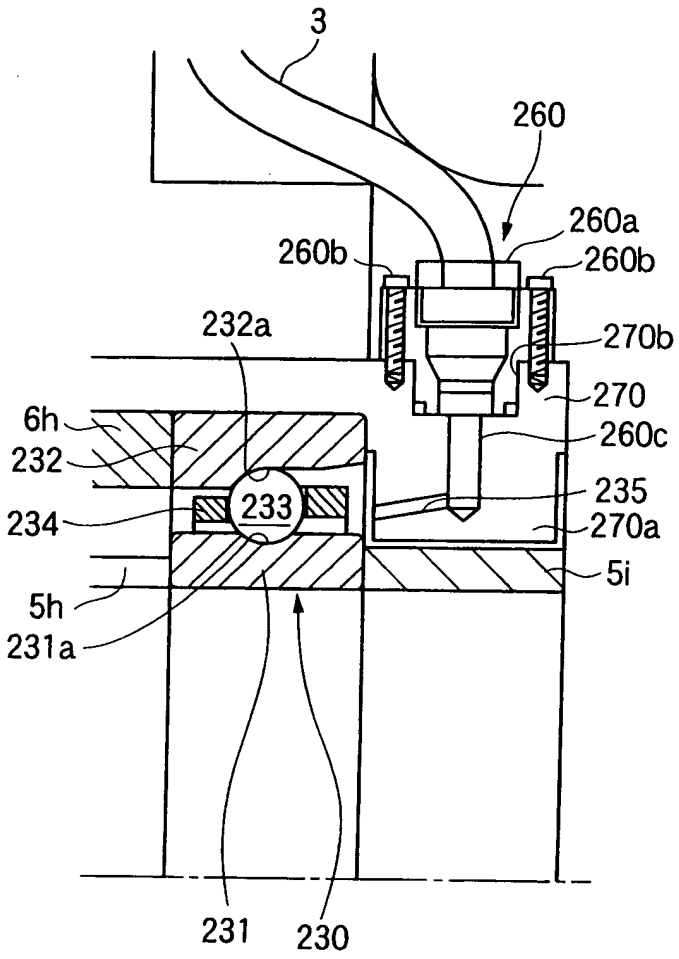
225
5g
5f
221a
221
220

FIG. 21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270a
5i
5h
231a
231
230

FIG. 22

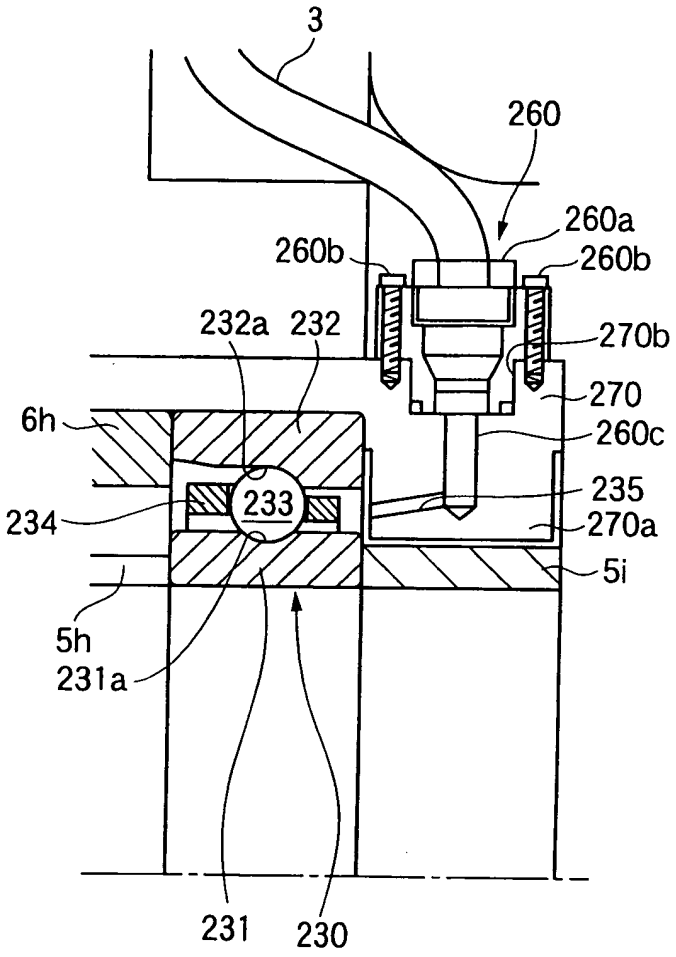
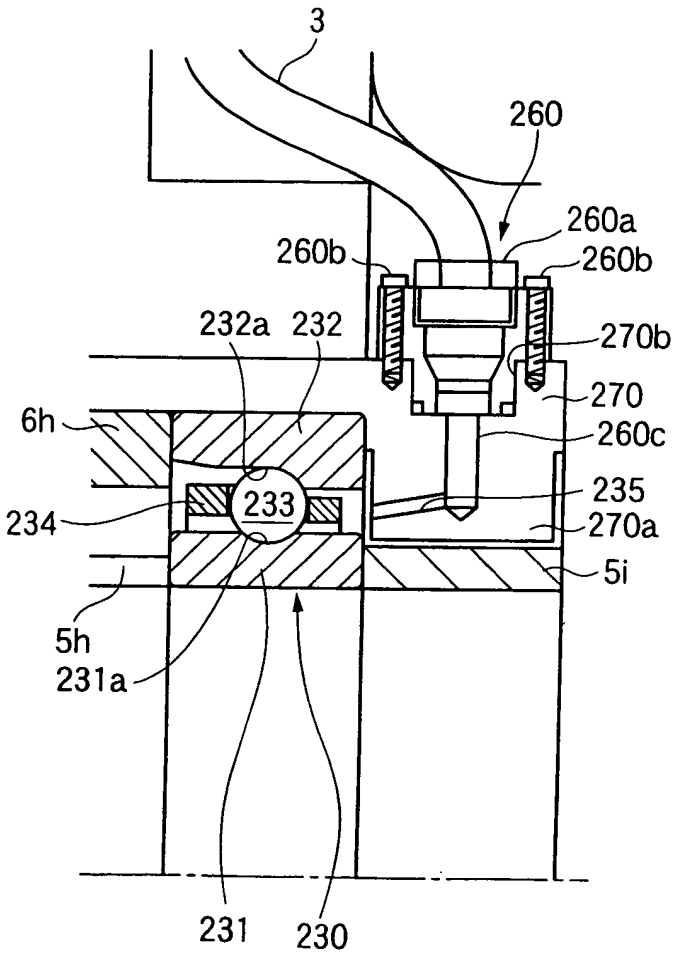


FIG. 23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260c
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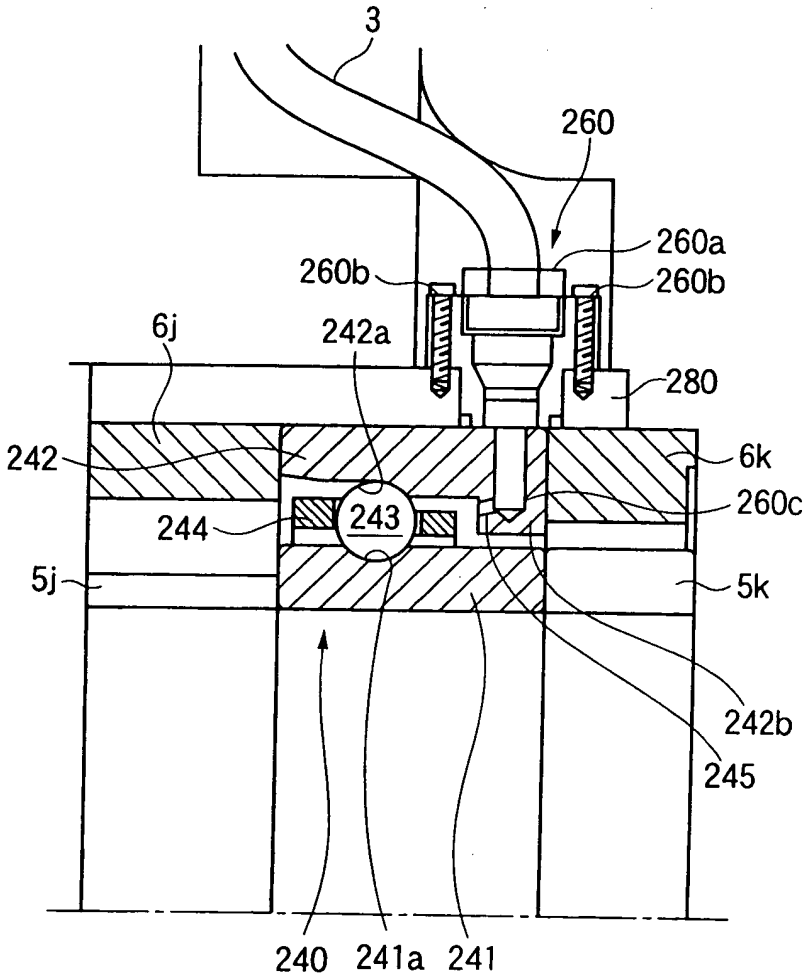
234
270a
5i
5h
231a
231
230

FIG. 24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6k
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5j
5k
242b
245
240
241a
241

FIG. 25

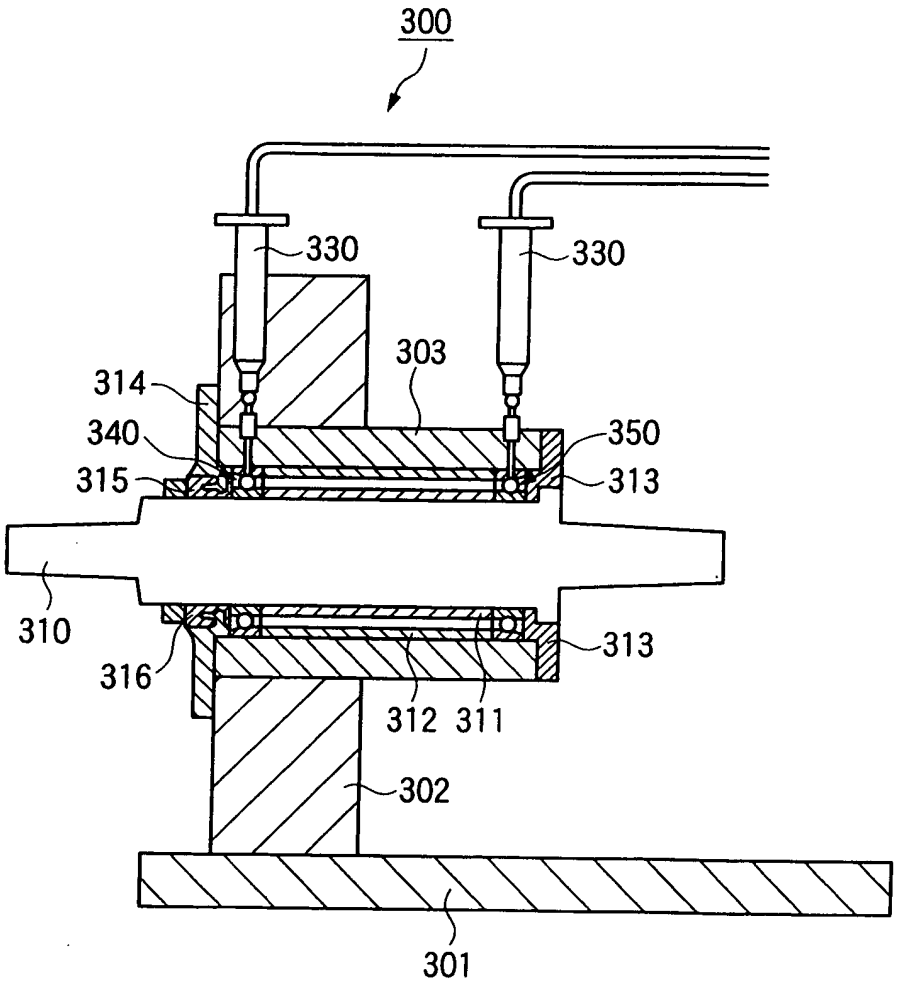


FIG. 26 (a)

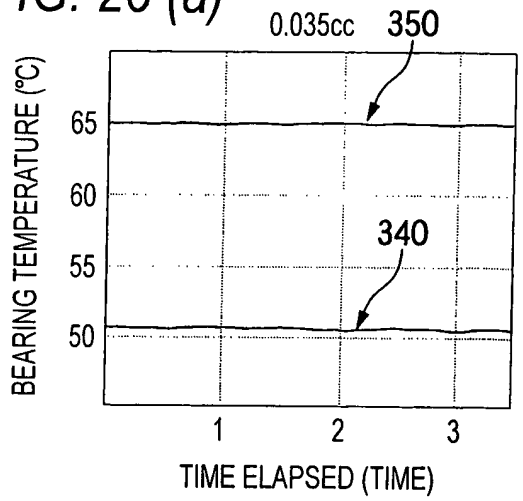


FIG. 26 (b)

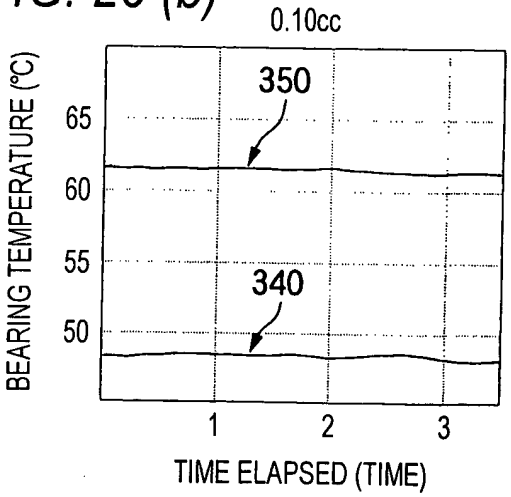


FIG. 26 (c)

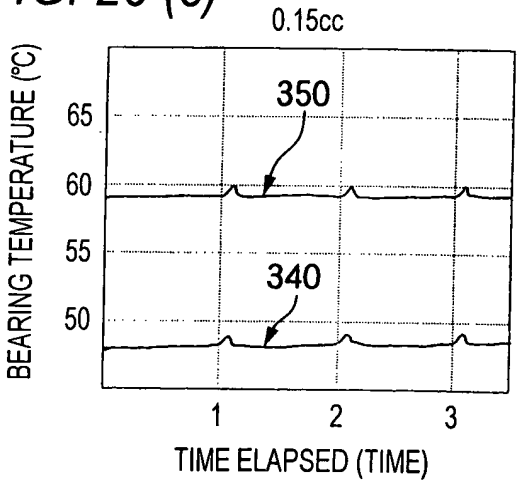


FIG. 26 (d)

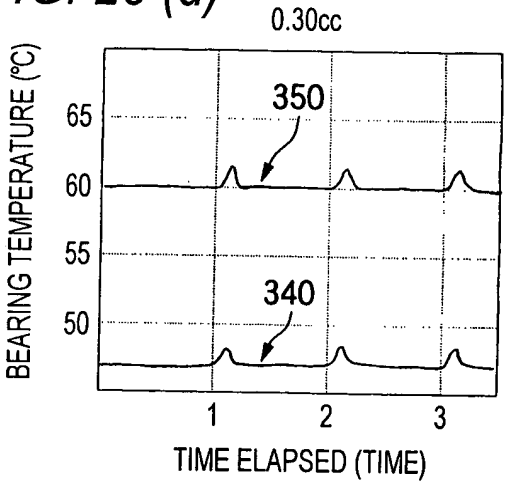


FIG. 26 (e)

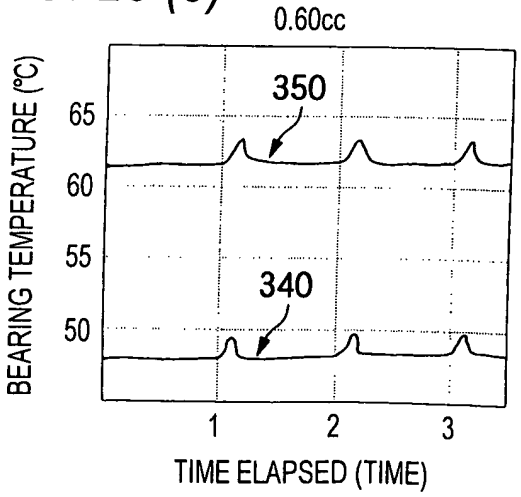


FIG. 27 (a)

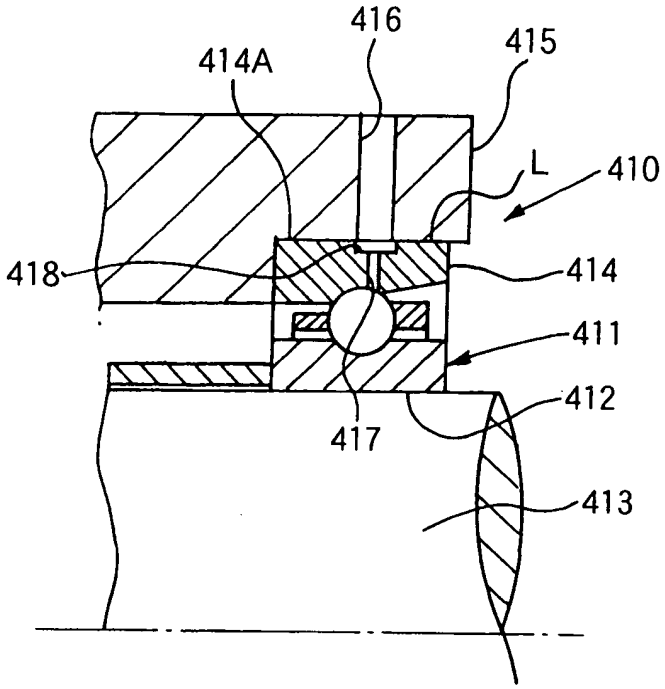


FIG. 27 (b)

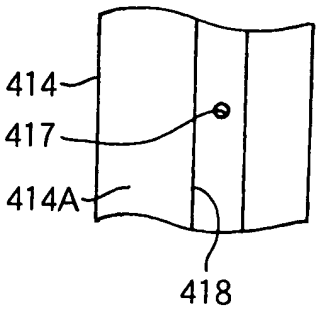


FIG. 28 (a)

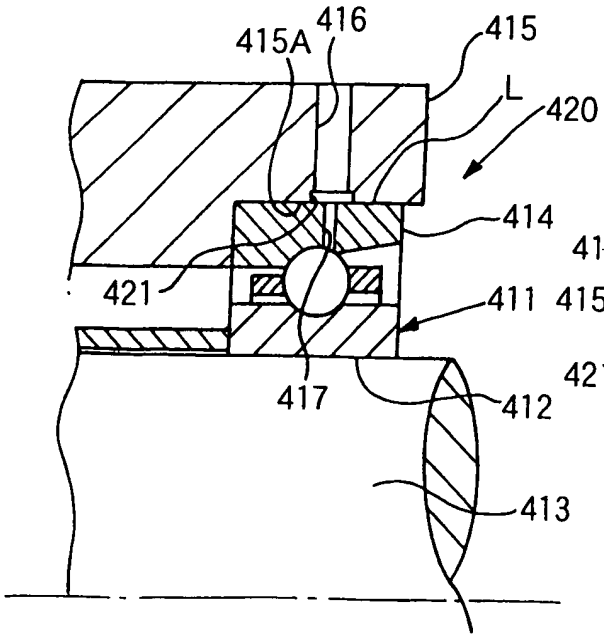


FIG. 28 (b)

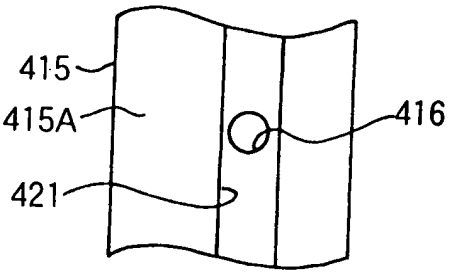


FIG. 29 (a)

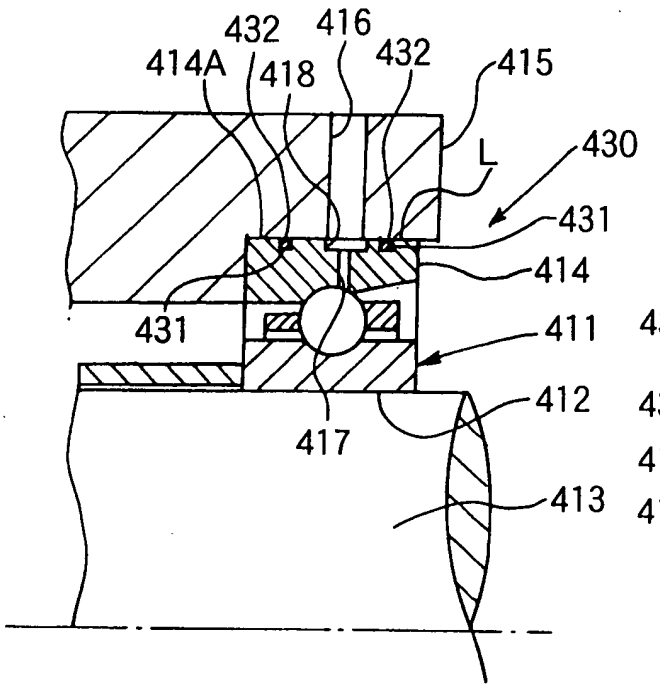


FIG. 29 (b)

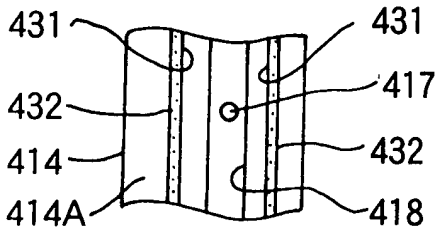


FIG. 30 (a)

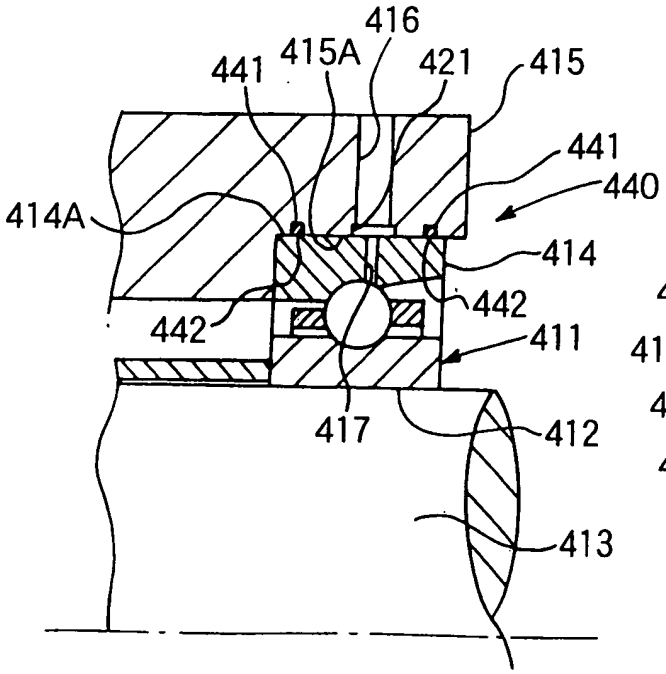


FIG. 30 (b)

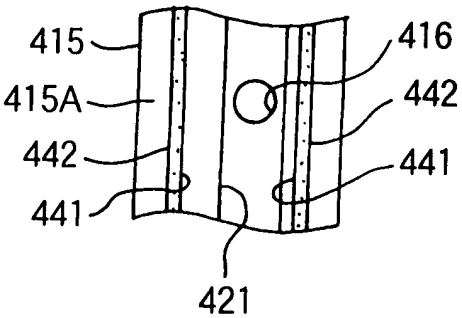


FIG. 31

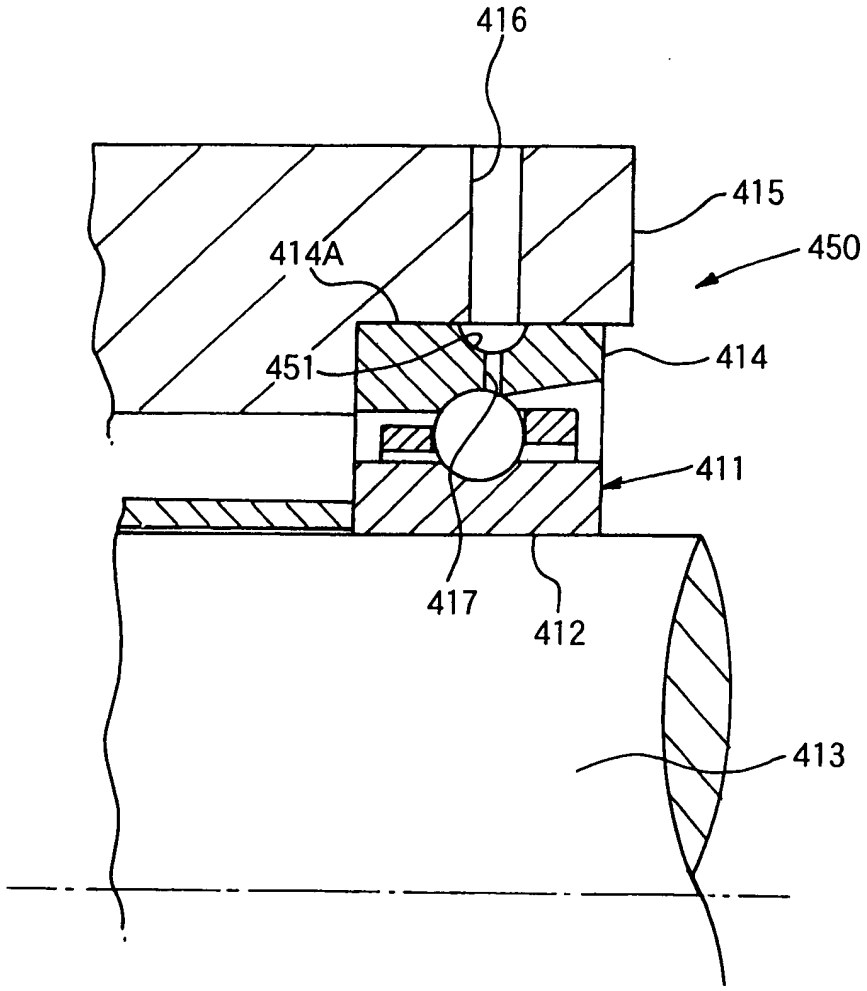


FIG. 32

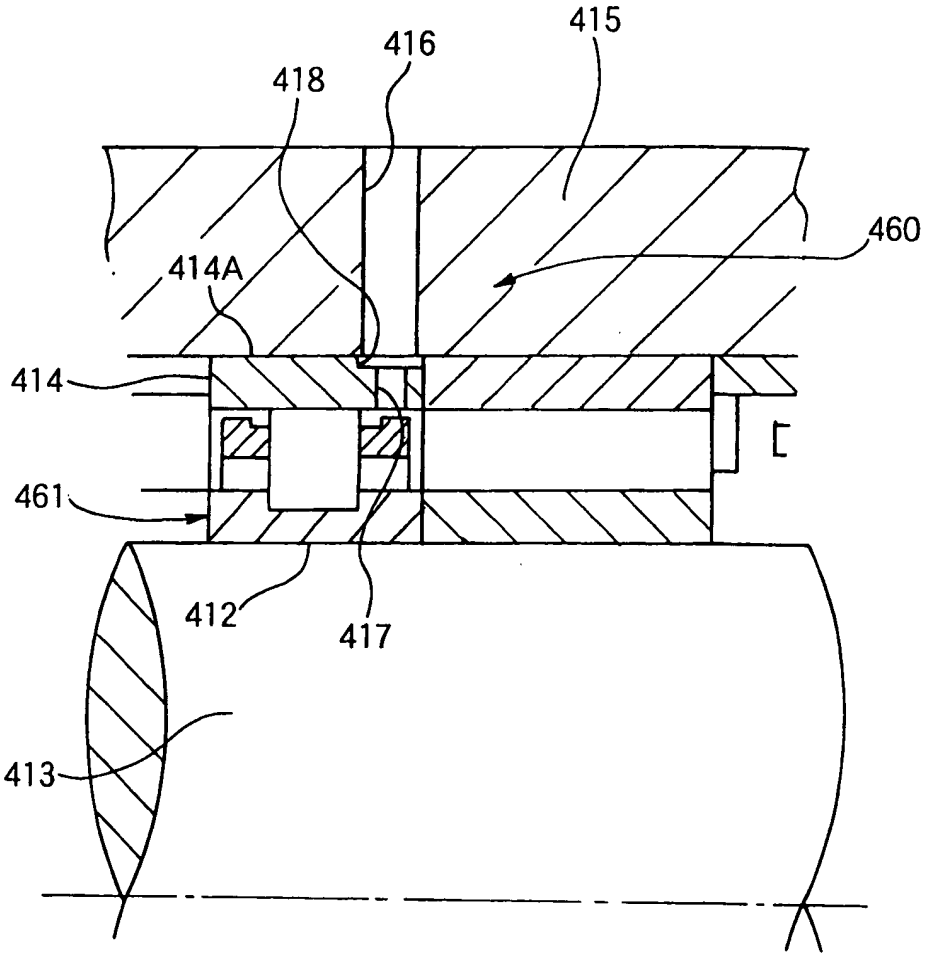


FIG. 33

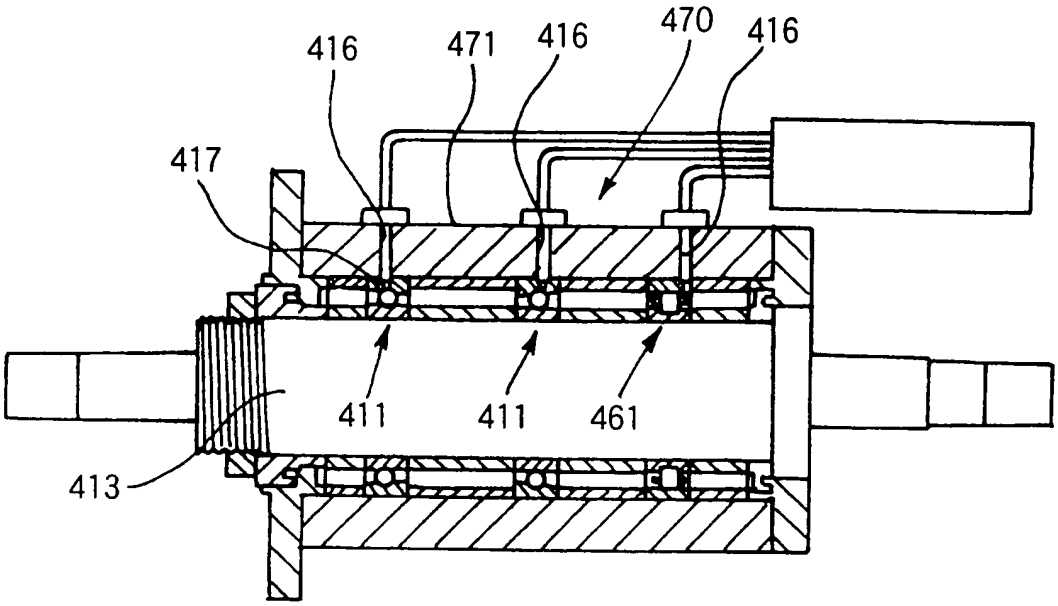


FIG. 34

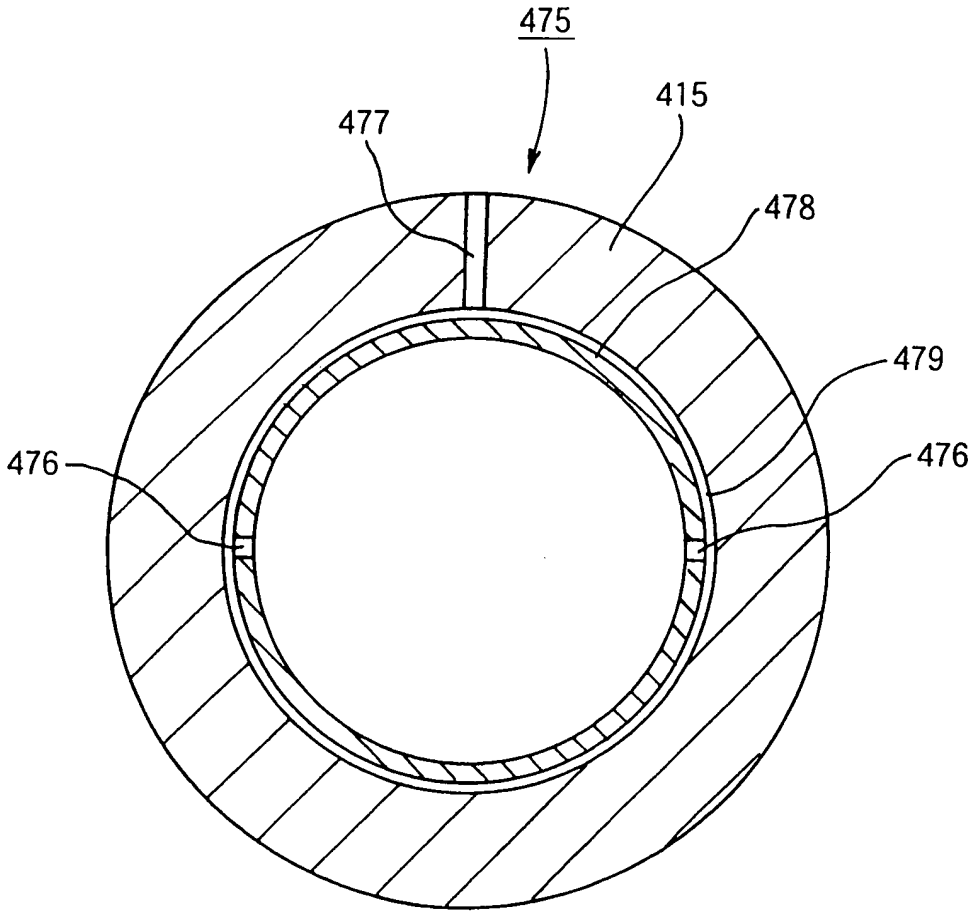


FIG. 35 (b)

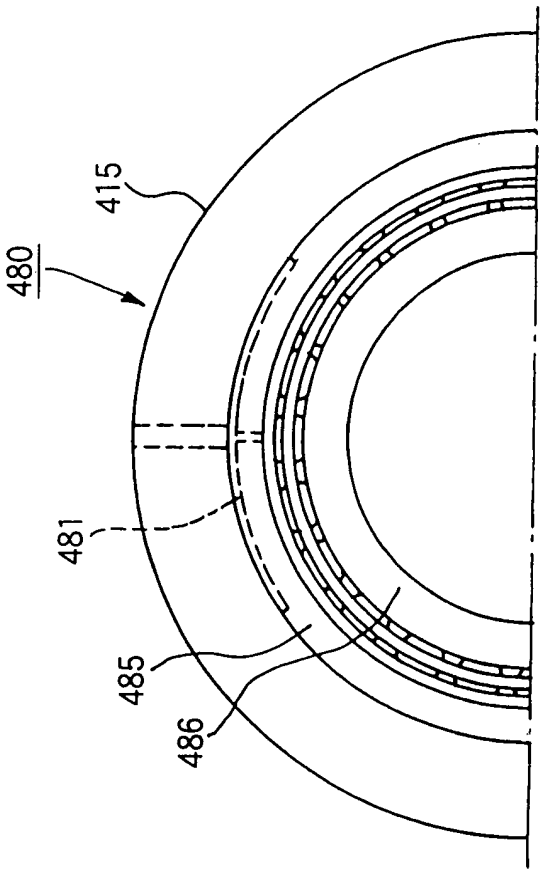


FIG. 35 (a)

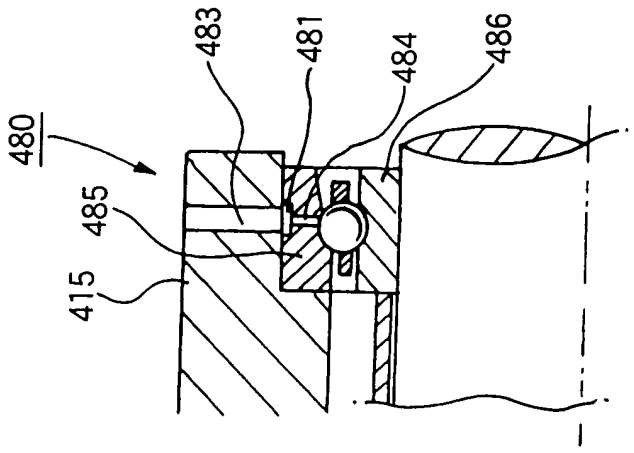


FIG. 36 (b)

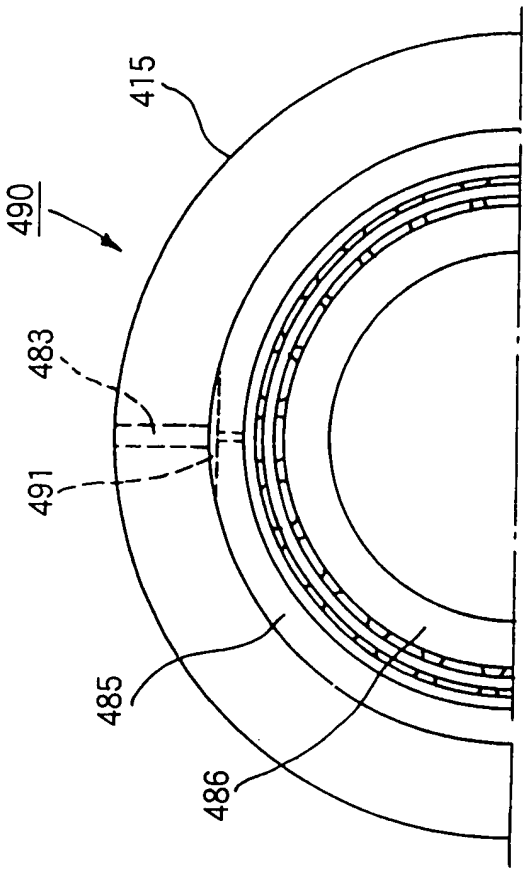


FIG. 36 (a)

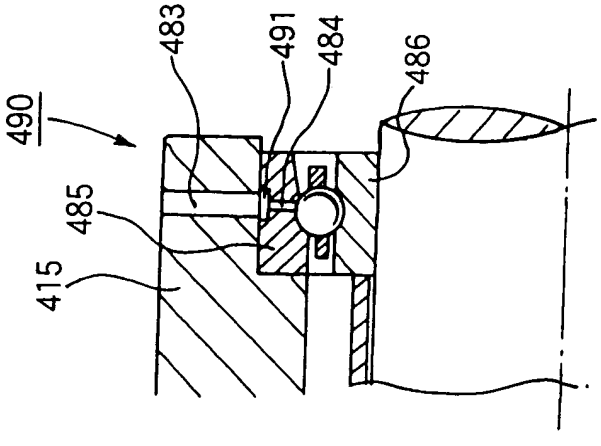


FIG. 37 (b)

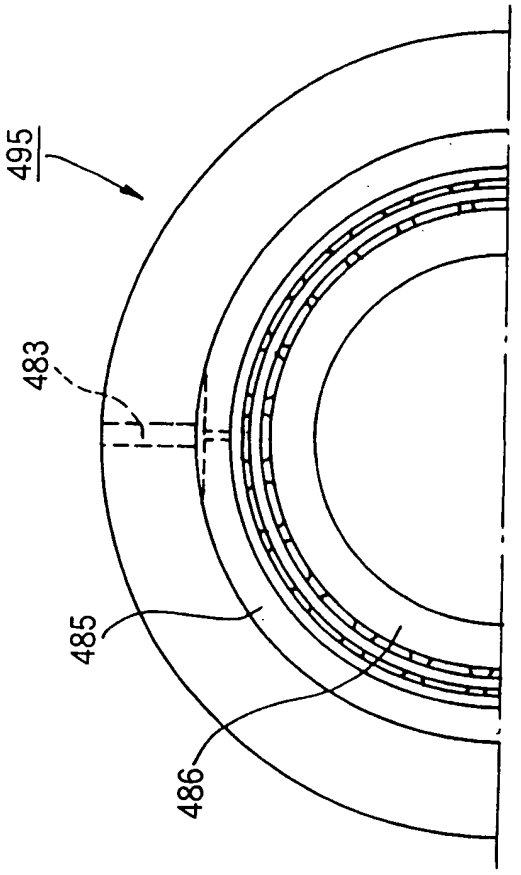


FIG. 37 (a)

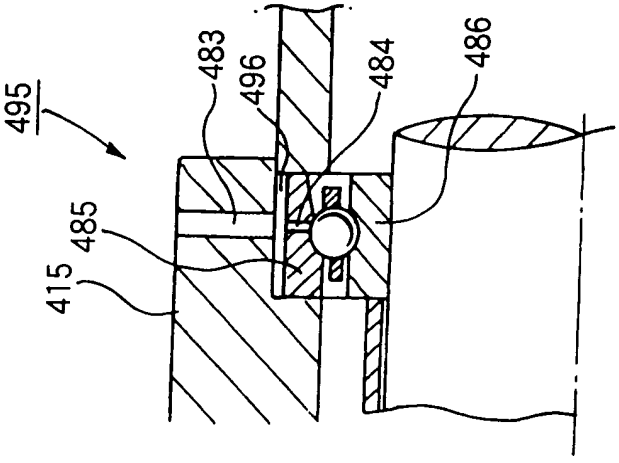


FIG. 38 (b)

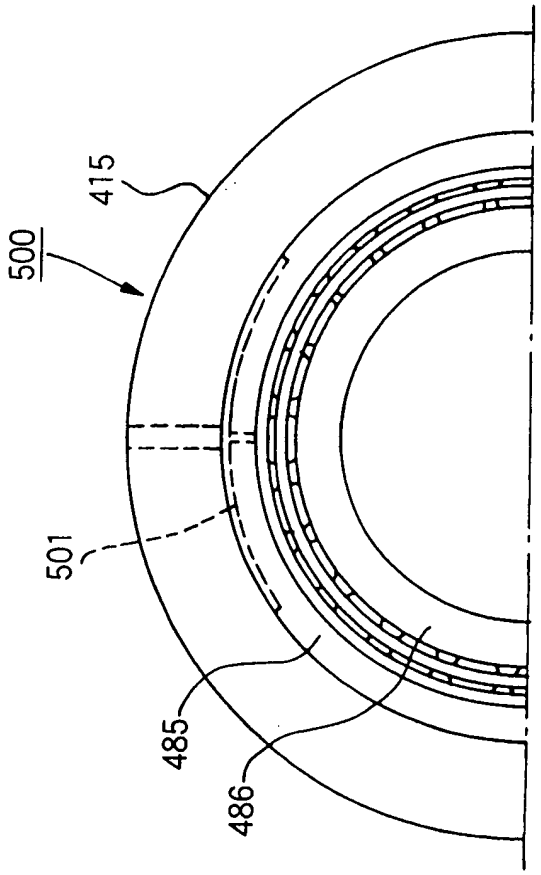


FIG. 38 (a)

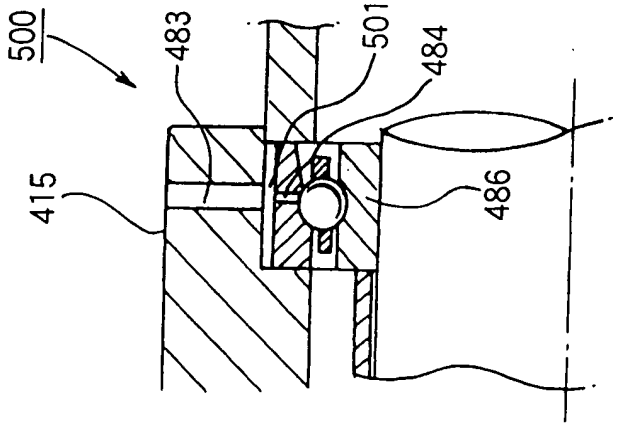


FIG. 39 (a)

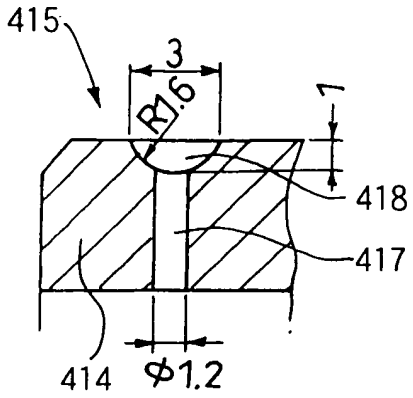


FIG. 39 (b)

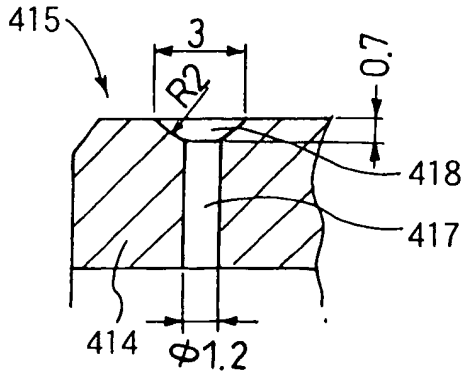


FIG. 39 (c)

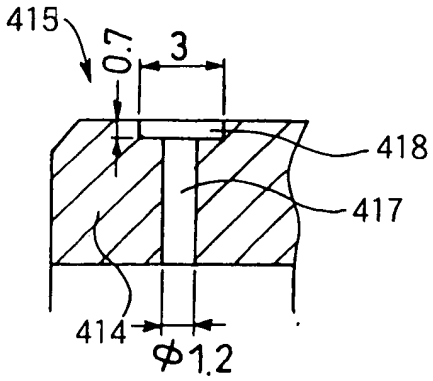


FIG. 39 (d)

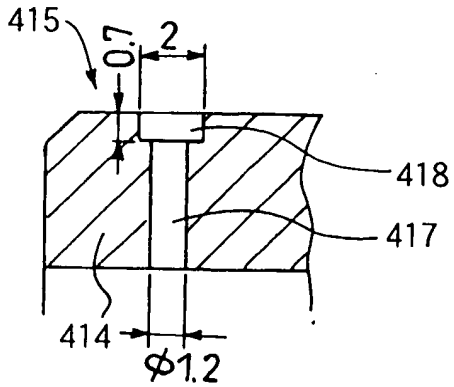


FIG. 39 (e)

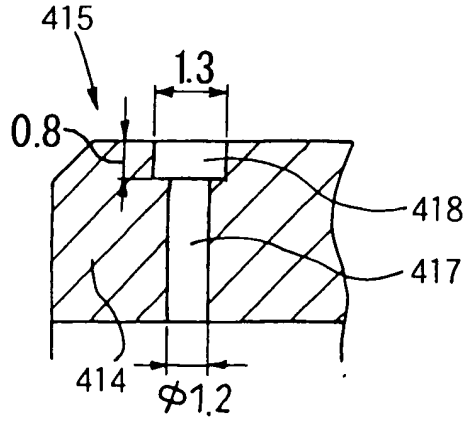


FIG. 39 (f)

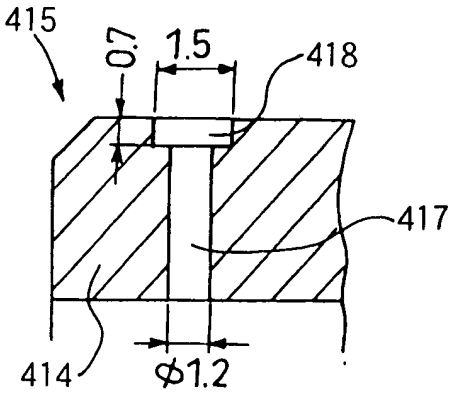


FIG. 40

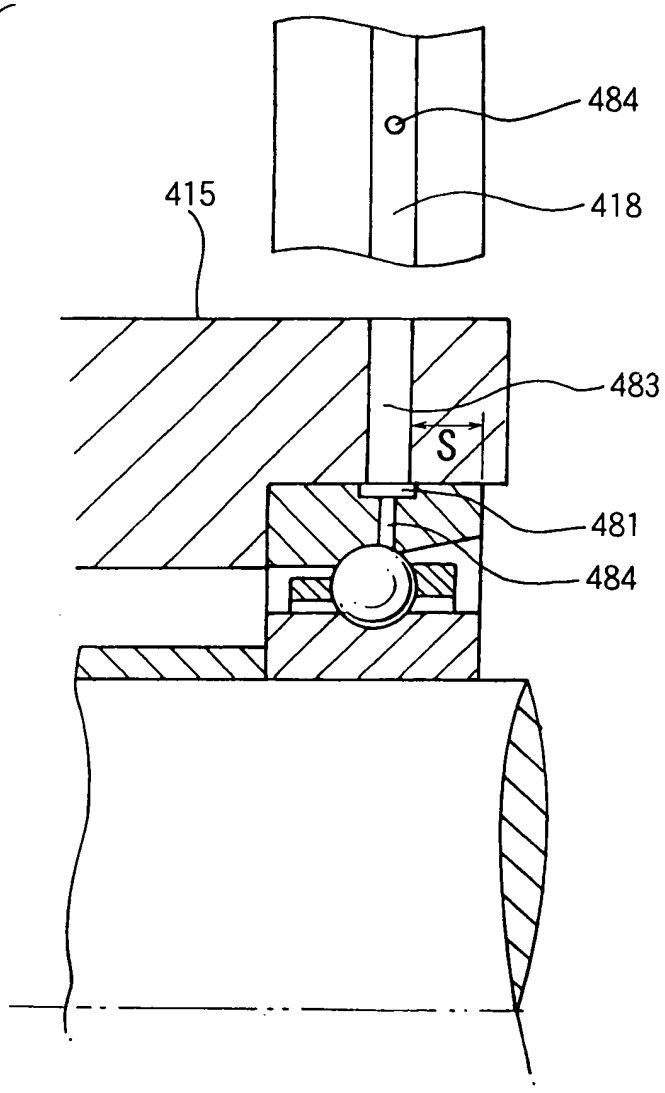
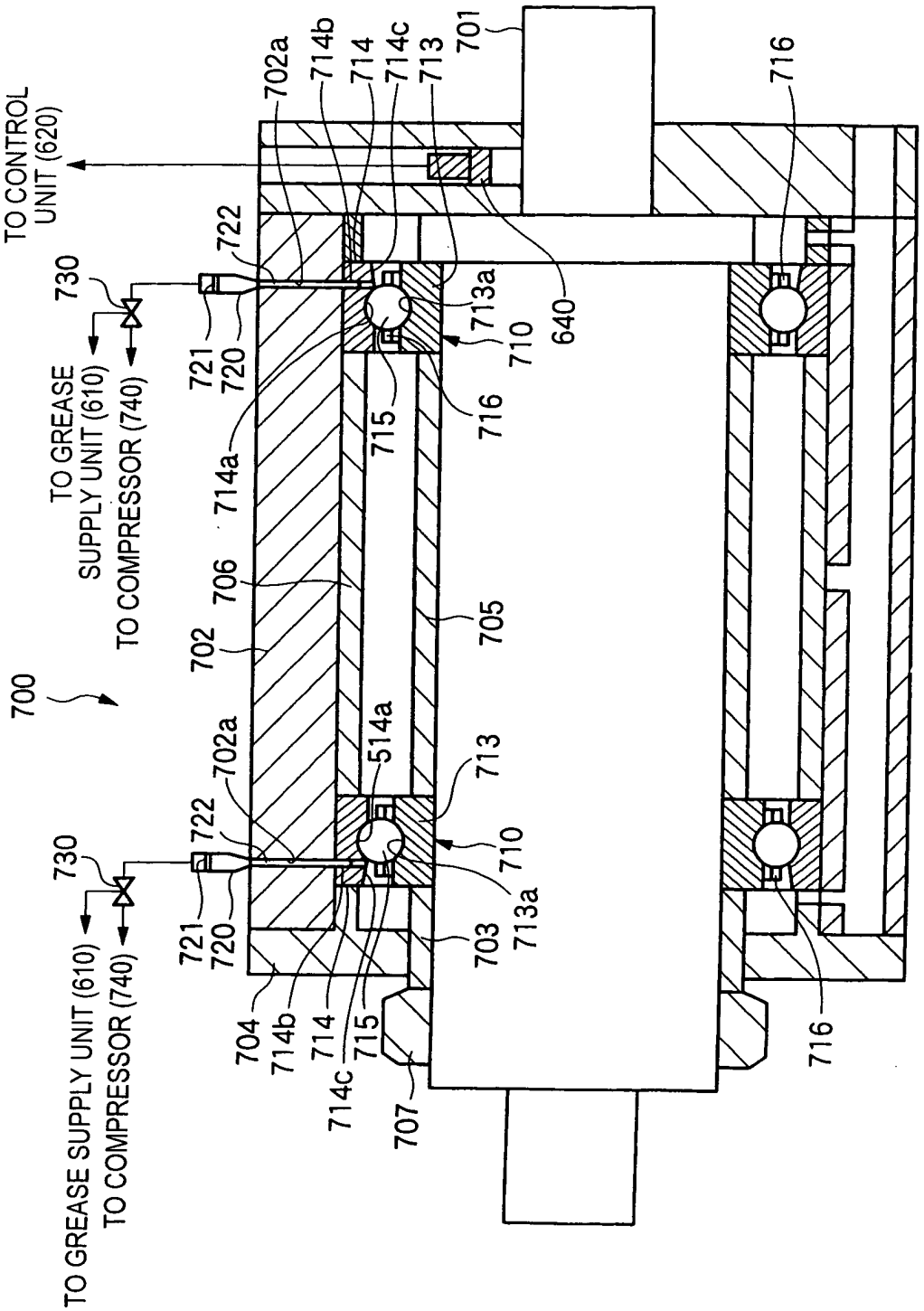


FIG. 41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TO GREASE SUPPLY UNIT (610)
TO COMPRESSOR (740)
700
701
702
702a
703
704
705
706
707
710
713
713a
714
714a
714b
714c
715
716
720
721
722
730
514a
640

FIG. 42

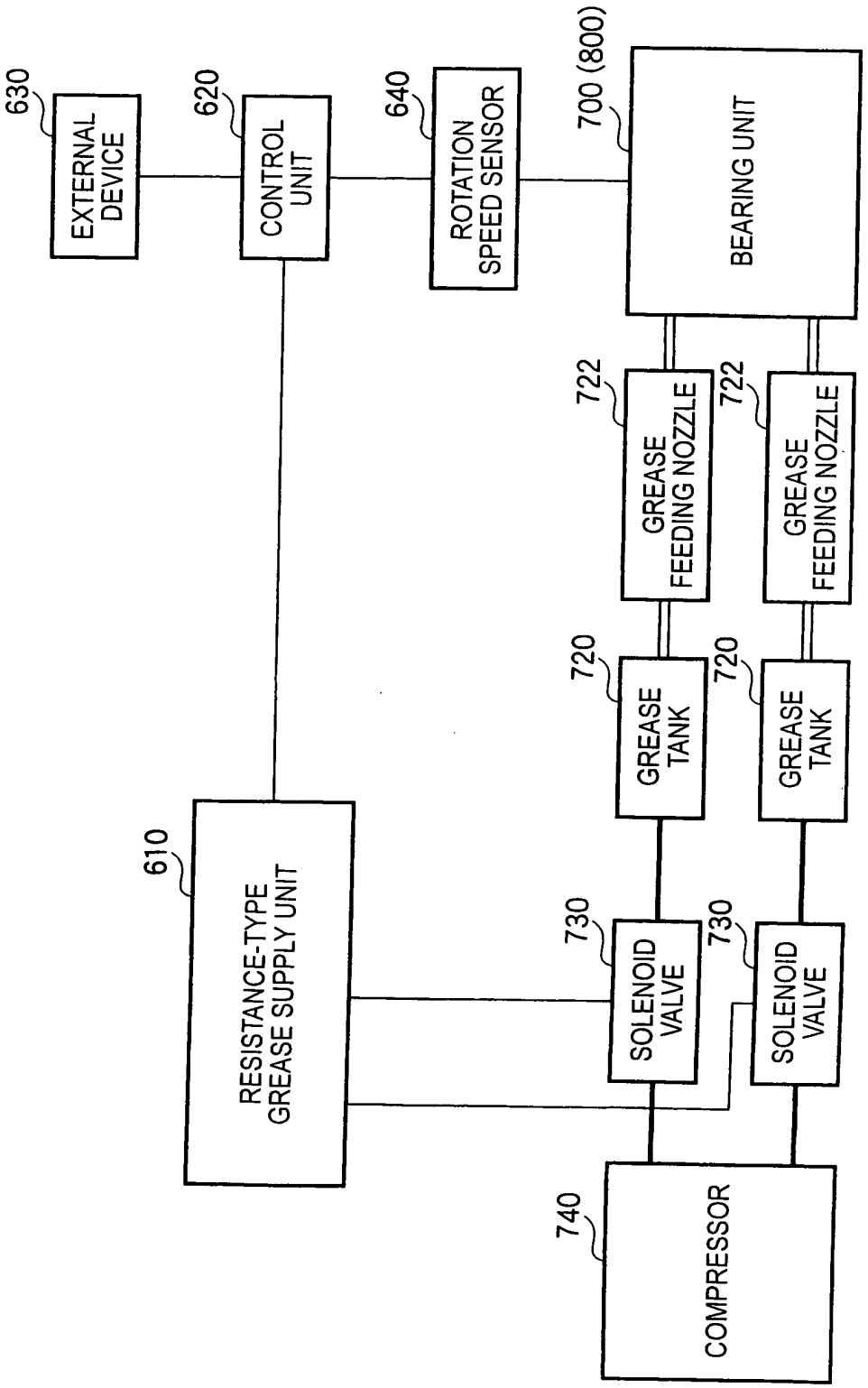

630
EXTERNAL DEVICE
620
CONTROL UNIT
640
ROTATION SPEED SENSOR
700 (800)
BEARING UNIT
722
GREASE FEEDING NOZZLE
722
GREASE FEEDING NOZZLE
720
GREASE TANK
720
GREASE TANK
610
RESISTANCE-TYPE GREASE SUPPLY UNIT
730
SOLENOID VALVE
730
SOLENOID VALVE
740
COMPRESSOR

FIG. 43

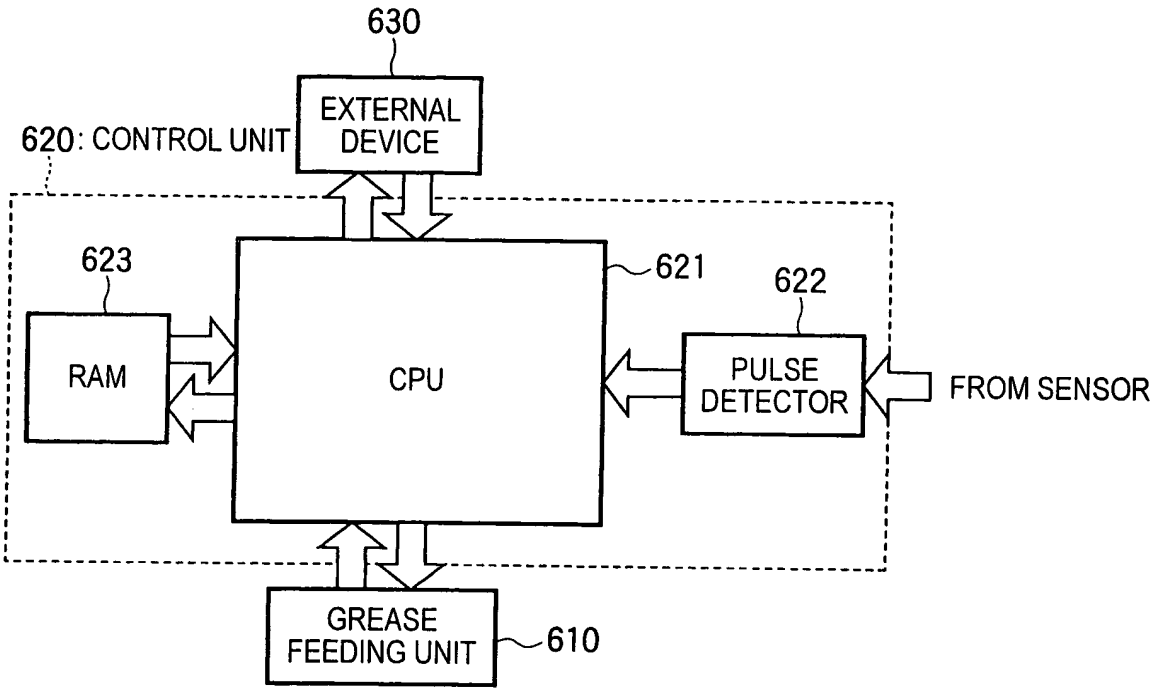
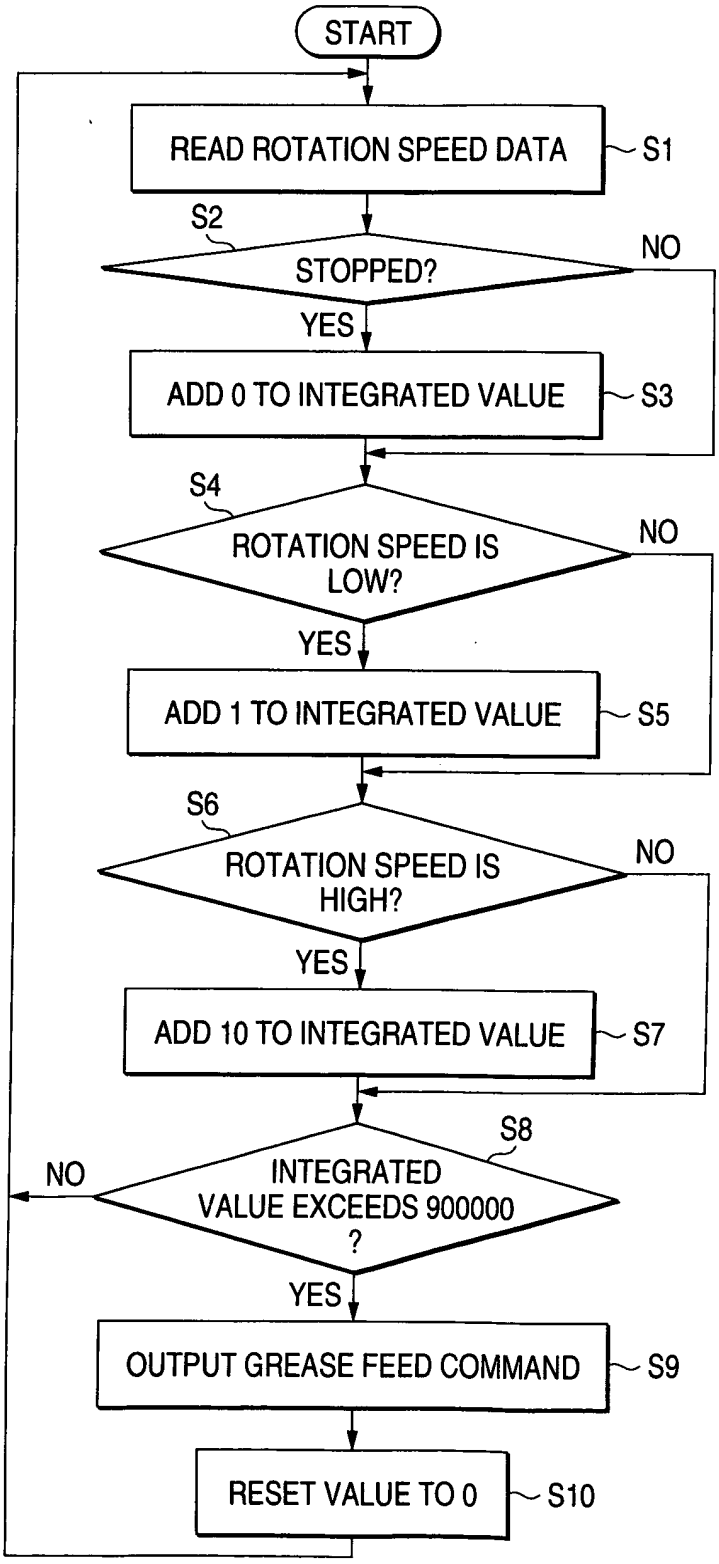

630
EXTERNAL DEVICE
620: CONTROL UNIT
623
621
622
RAM
CPU
PULSE DETECTOR
FROM SENSOR
GREASE FEEDING UNIT
610

FIG. 44


START
READ ROTATION SPEED DATA
S1
S2
STOPPED?
NO
YES
ADD 0 TO INTEGRATED VALUE
S3
S4
ROTATION SPEED IS LOW?
NO
YES
ADD 1 TO INTEGRATED VALUE
S5
S6
ROTATION SPEED IS HIGH?
NO
YES
ADD 10 TO INTEGRATED VALUE
S7
S8
INTEGRATED VALUE EXCEEDS 900000 ?
NO
YES
OUTPUT GREASE FEED COMMAND
S9
RESET VALUE TO 0
S10

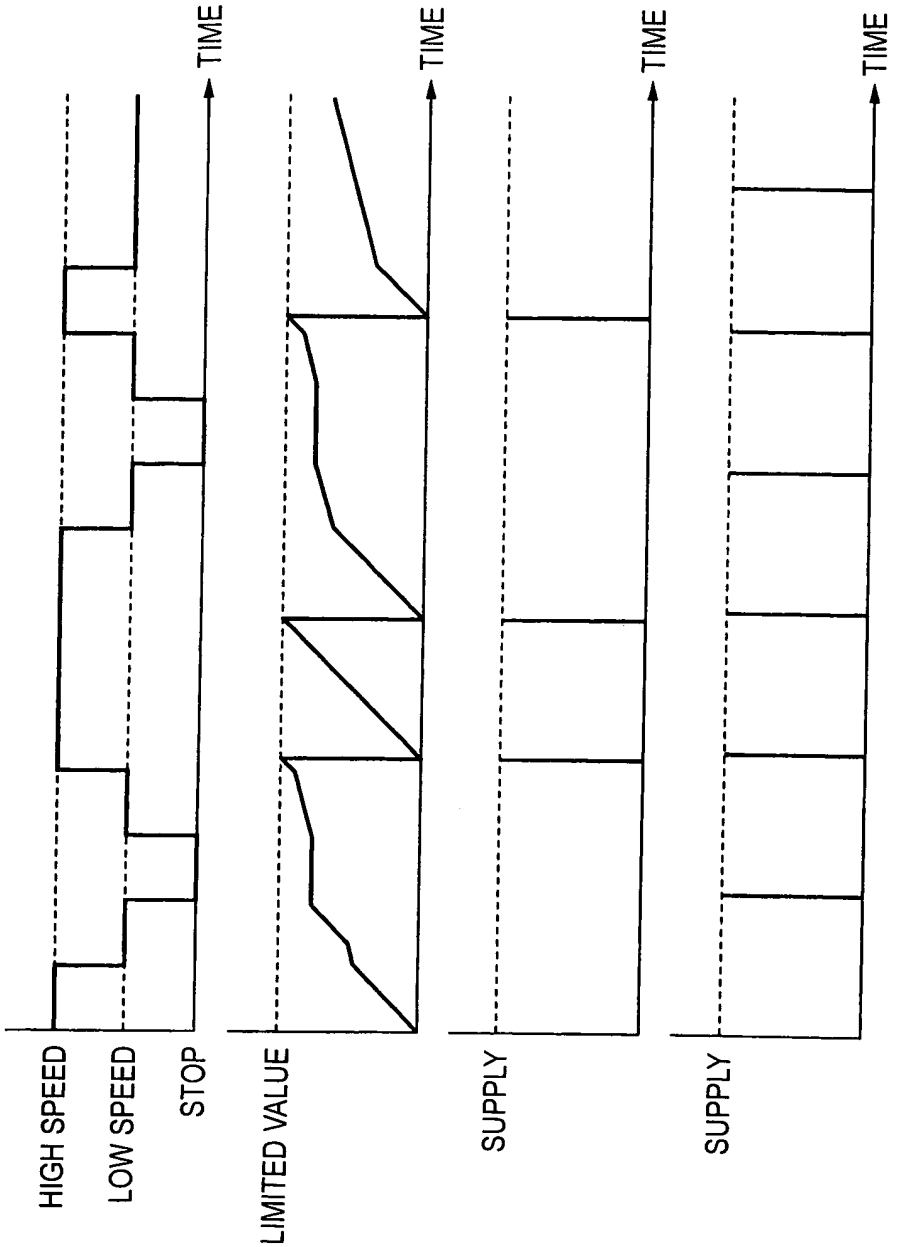


FIG. 45 (a)

FIG. 45 (b)

FIG. 45 (c)

FIG. 45 (d)

FIG. 46

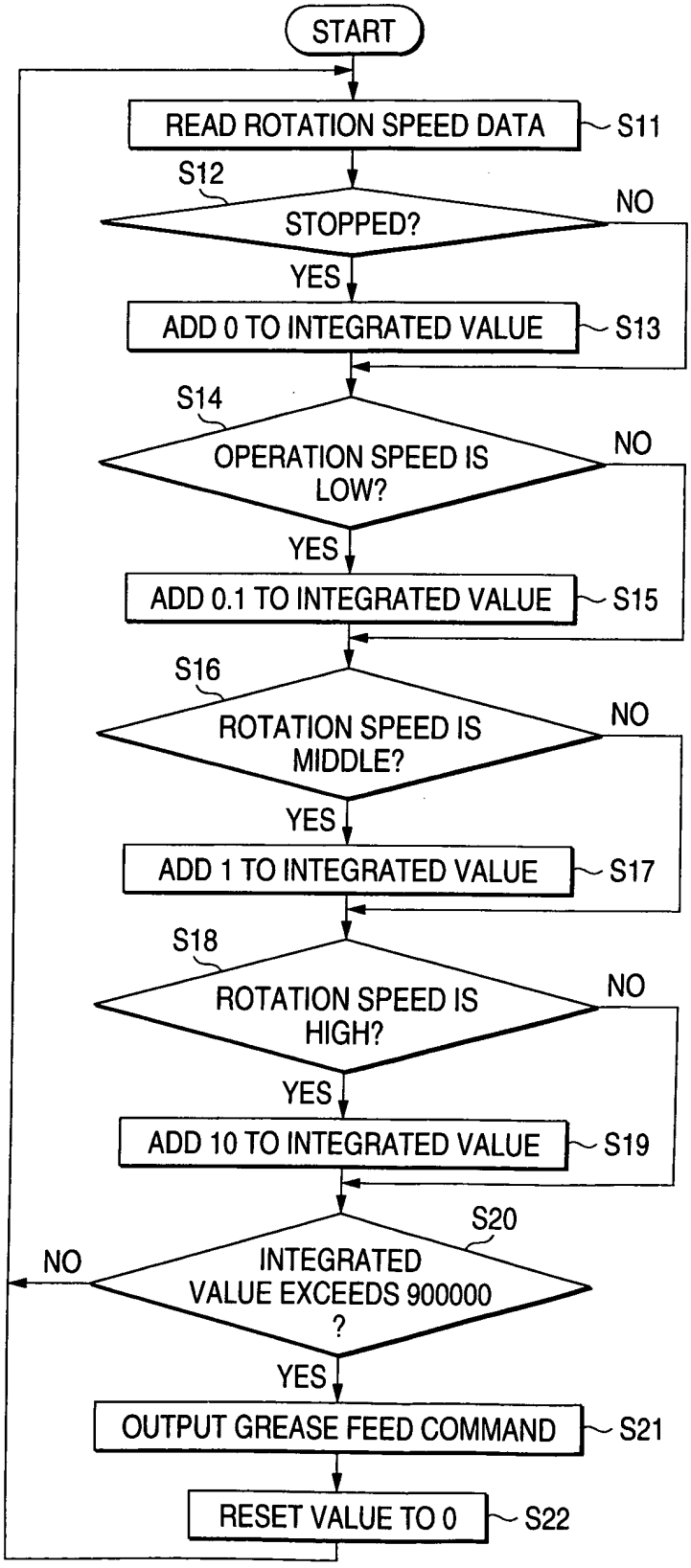

START
READ ROTATION SPEED DATA
S11
S12
STOPPED?
NO
YES
ADD 0 TO INTEGRATED VALUE
S13
S14
OPERATION SPEED IS LOW?
NO
YES
ADD 0.1 TO INTEGRATED VALUE
S15
S16
ROTATION SPEED IS MIDDLE?
NO
YES
ADD 1 TO INTEGRATED VALUE
S17
S18
ROTATION SPEED IS HIGH?
NO
YES
ADD 10 TO INTEGRATED VALUE
S19
S20
INTEGRATED VALUE EXCEEDS 900000 ?
NO
YES
OUTPUT GREASE FEED COMMAND
S21
RESET VALUE TO 0
S22

FIG. 54

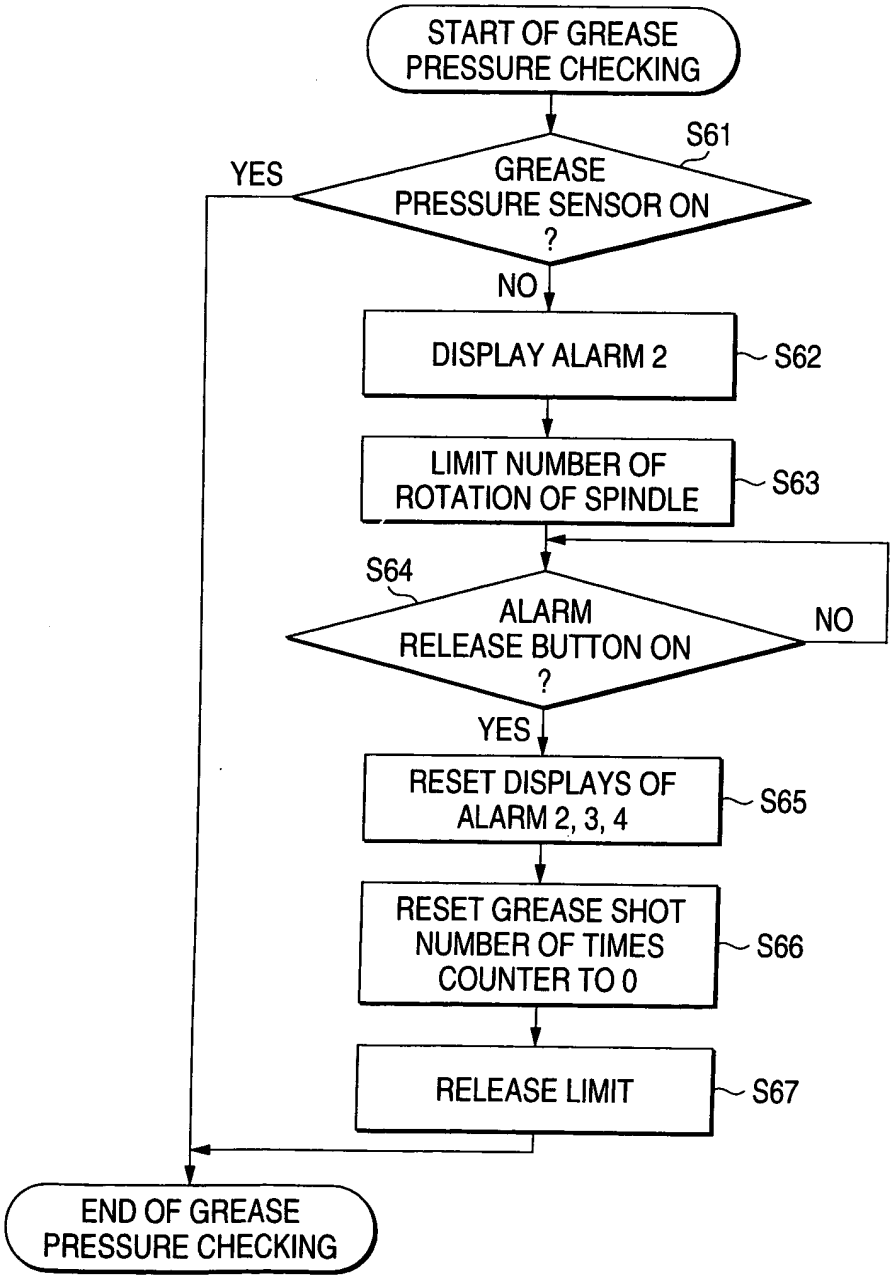

START OF GREASE PRESSURE CHECKING
S61
GREASE PRESSURE SENSOR ON ?
YES
NO
DISPLAY ALARM 2
S62
LIMIT NUMBER OF ROTATION OF SPINDLE
S63
S64
ALARM RELEASE BUTTON ON ?
NO
YES
RESET DISPLAYS OF ALARM 2, 3, 4
S65
RESET GREASE SHOT NUMBER OF TIMES COUNTER TO 0
S66
RELEASE LIMIT
S67
END OF GREASE PRESSURE CHECKING

FIG. 48

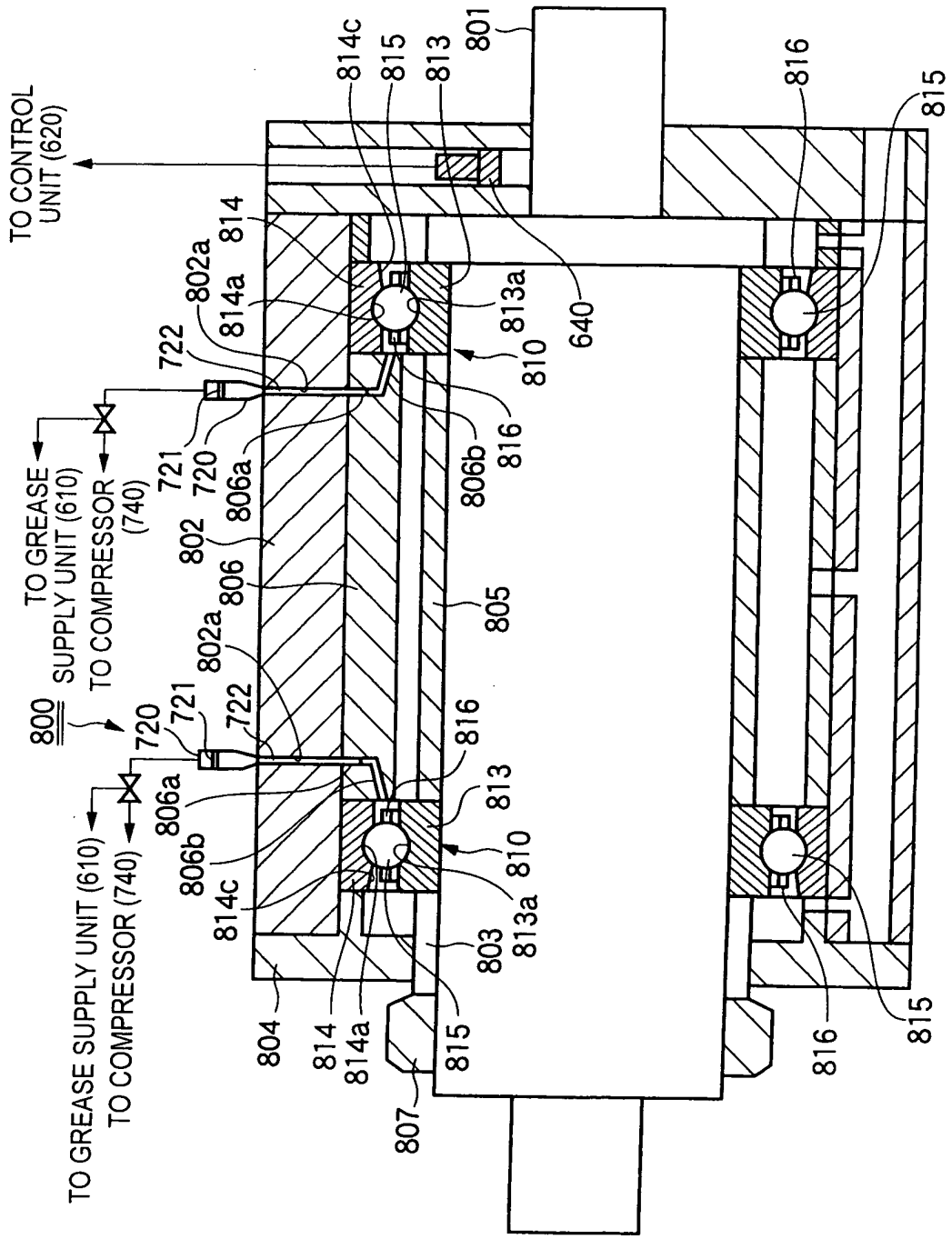

TO CONTROL UNIT (620)
TO GREASE SUPPLY UNIT (610)
TO COMPRESSOR (740)
800
TO GREASE SUPPLY UNIT (610)
TO COMPRESSOR (740)
801
813
814c
815
816
814
814a
802a
722
721
720
806a
806b
802
806
805
810
813a
640
803
804
807

FIG. 49

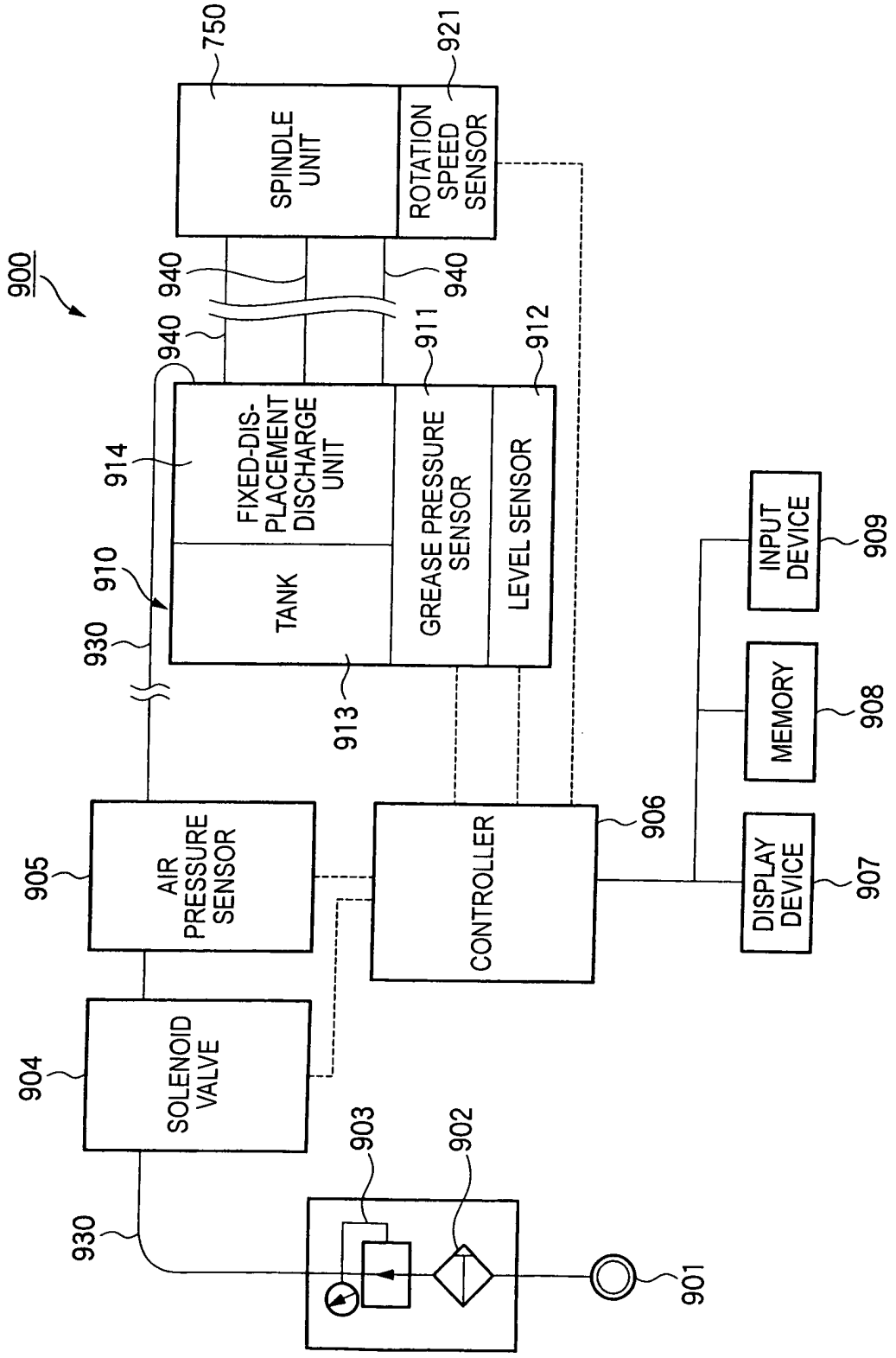

900
750
SPINDLE UNIT
921
ROTATION SPEED SENSOR
940
940
940
911
912
914
FIXED-DIS-PLACEMENT DISCHARGE UNIT
910
TANK
GREASE PRESSURE SENSOR
LEVEL SENSOR
930
913
INPUT DEVICE
909
MEMORY
908
DISPLAY DEVICE
907
905
AIR PRESSURE SENSOR
CONTROLLER
906
904
SOLENOID VALVE
903
902
930
901

FIG. 50

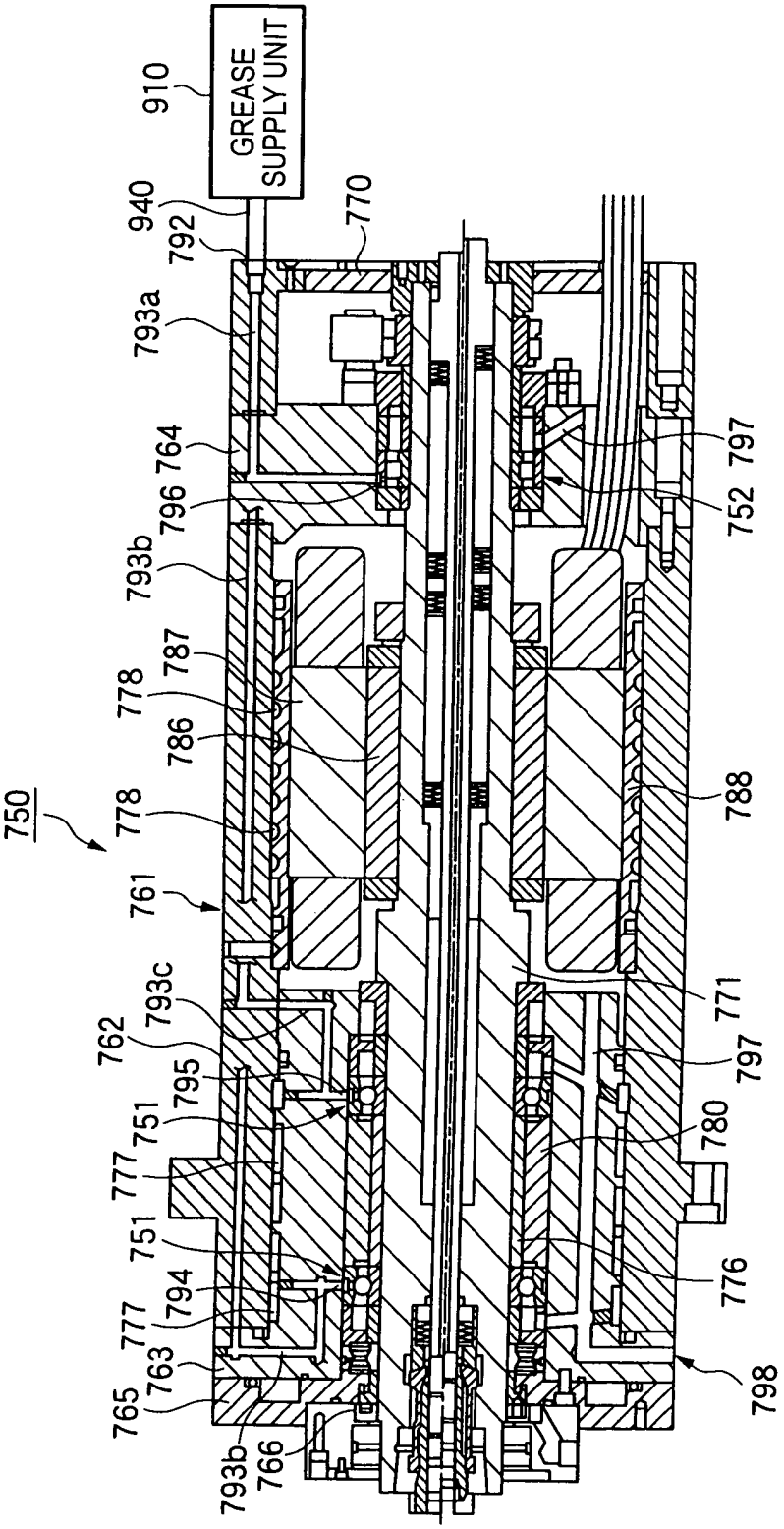

GREASE SUPPLY UNIT
910
940
792
770
793a
764
796
797
752
793b
787
778
786
750
778
788
761
771
793c
762
795
797
751
780
777
751
776
794
777
763
765
798
793b
766

FIG. 51

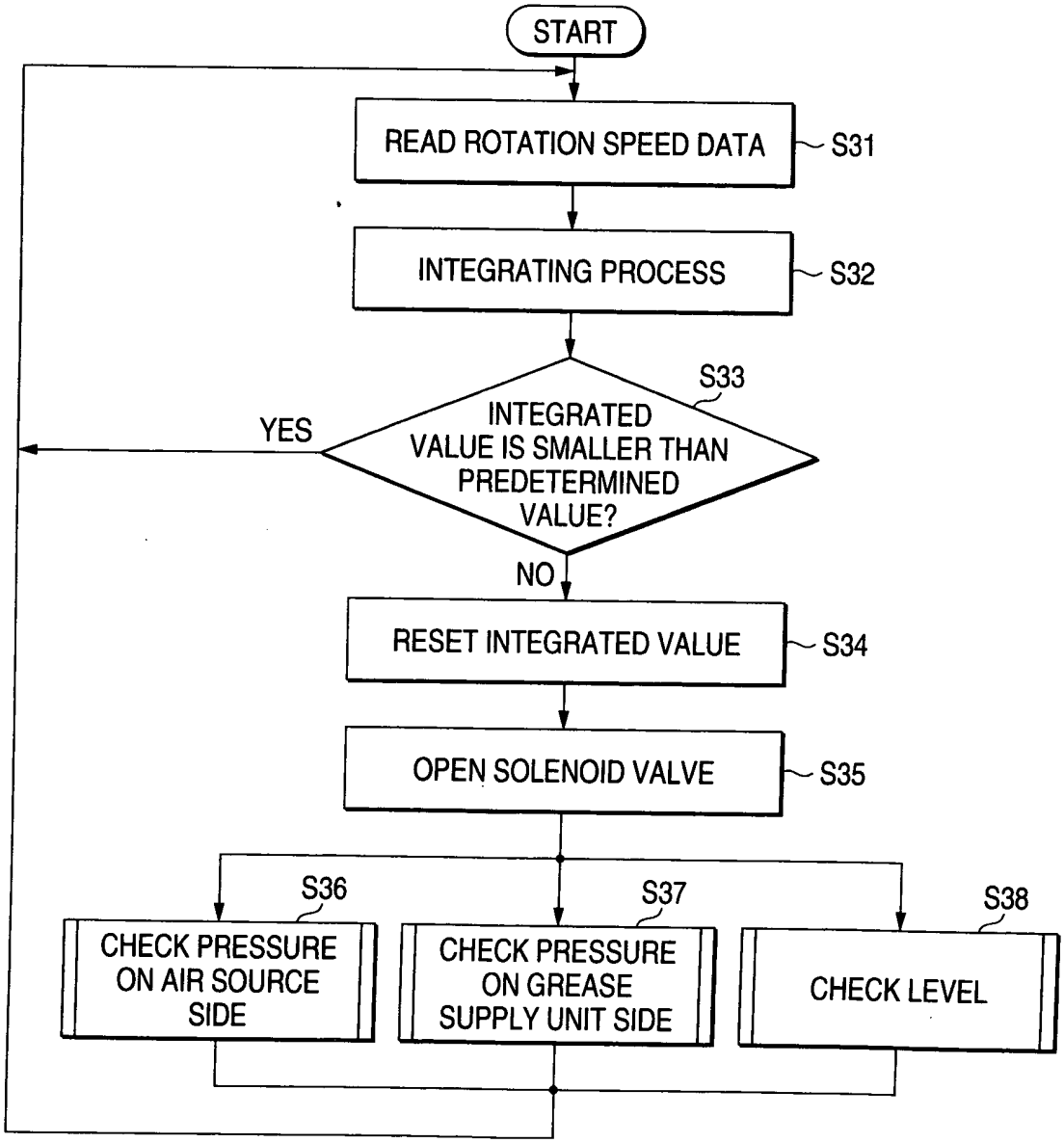

START
READ ROTATION SPEED DATA
S31
INTEGRATING PROCESS
S32
S33
INTEGRATED VALUE IS SMALLER THAN PREDETERMINED VALUE?
YES
NO
RESET INTEGRATED VALUE
S34
OPEN SOLENOID VALVE
S35
S36
S37
S38
CHECK PRESSURE ON AIR SOURCE SIDE
CHECK PRESSURE ON GREASE SUPPLY UNIT SIDE
CHECK LEVEL

FIG. 52

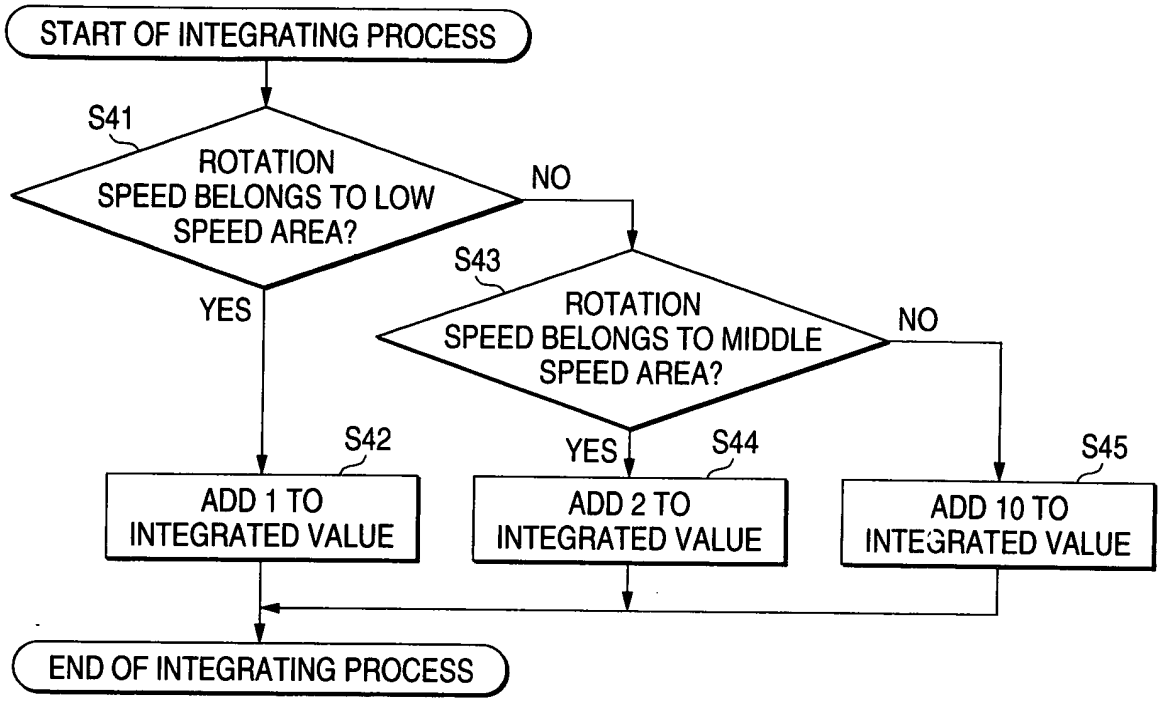

START OF INTEGRATING PROCESS
S41
ROTATION SPEED BELONGS TO LOW SPEED AREA?
NO
YES
S43
ROTATION SPEED BELONGS TO MIDDLE SPEED AREA?
NO
YES
S42
ADD 1 TO INTEGRATED VALUE
S44
ADD 2 TO INTEGRATED VALUE
S45
ADD 10 TO INTEGRATED VALUE
END OF INTEGRATING PROCESS

FIG. 53

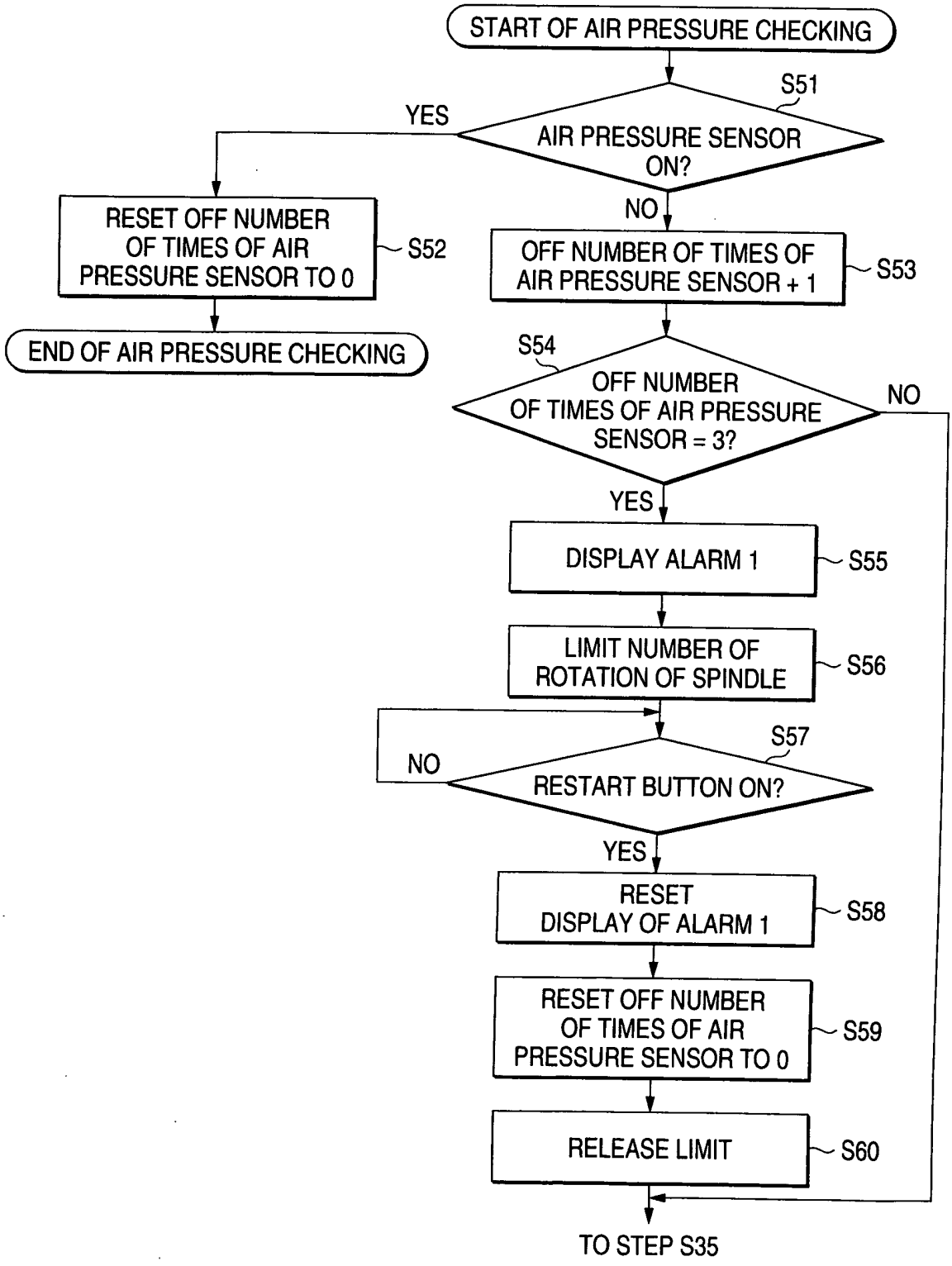

START OF AIR PRESSURE CHECKING
S51
AIR PRESSURE SENSOR ON?
YES
NO
RESET OFF NUMBER OF TIMES OF AIR PRESSURE SENSOR TO 0
S52
OFF NUMBER OF TIMES OF AIR PRESSURE SENSOR + 1
S53
END OF AIR PRESSURE CHECKING
S54
OFF NUMBER OF TIMES OF AIR PRESSURE SENSOR = 3?
NO
YES
DISPLAY ALARM 1
S55
LIMIT NUMBER OF ROTATION OF SPINDLE
S56
S57
NO
RESTART BUTTON ON?
YES
RESET DISPLAY OF ALARM 1
S58
RESET OFF NUMBER OF TIMES OF AIR PRESSURE SENSOR TO 0
S59
RELEASE LIMIT
S60
TO STEP S35

FIG. 54

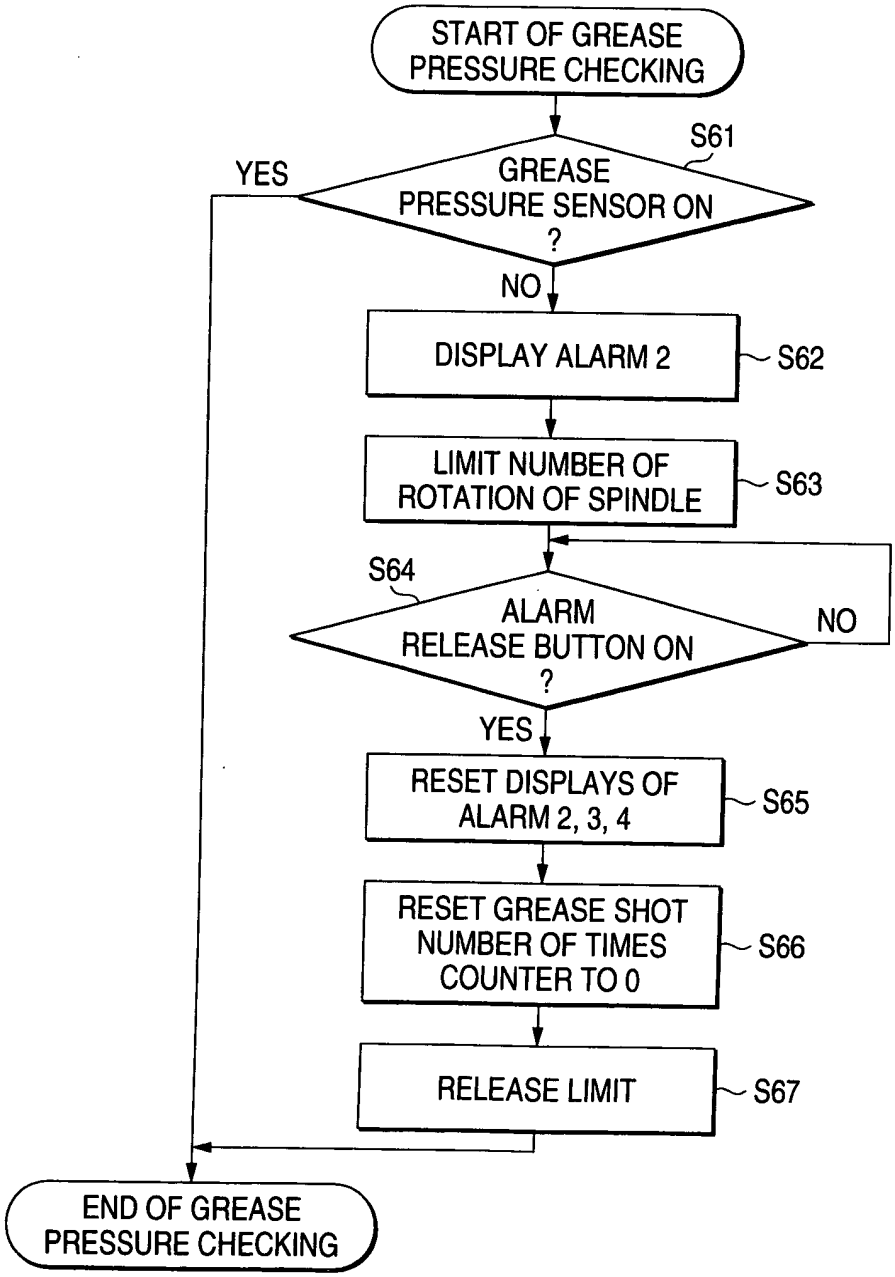

START OF GREASE PRESSURE CHECKING
S61
GREASE PRESSURE SENSOR ON ?
YES
NO
DISPLAY ALARM 2
S62
LIMIT NUMBER OF ROTATION OF SPINDLE
S63
S64
ALARM RELEASE BUTTON ON ?
NO
YES
RESET DISPLAYS OF ALARM 2, 3, 4
S65
RESET GREASE SHOT NUMBER OF TIMES COUNTER TO 0
S66
RELEASE LIMIT
S67
END OF GREASE PRESSURE CHECKING

FIG. 55

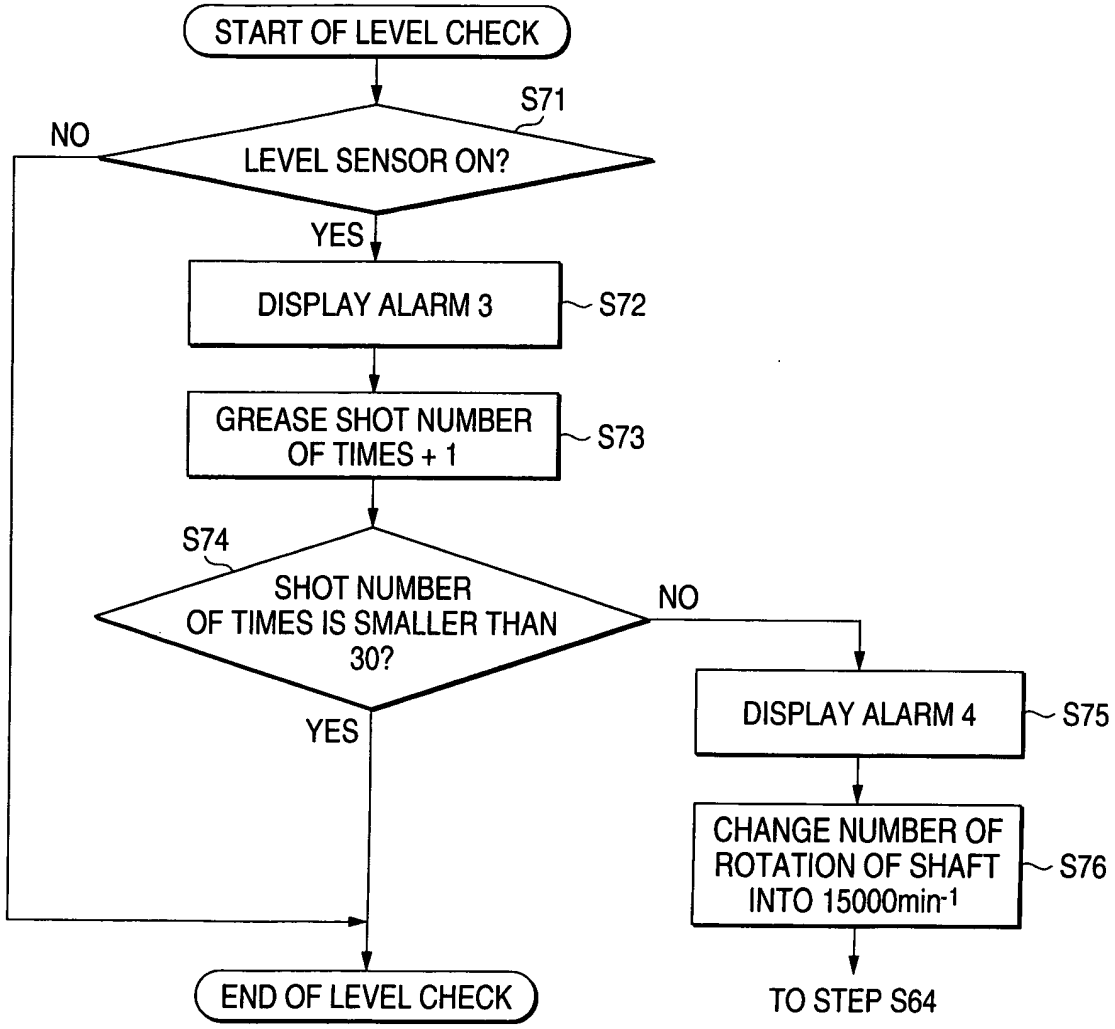

START OF LEVEL CHECK
S71
LEVEL SENSOR ON?
NO
YES
DISPLAY ALARM 3
S72
GREASE SHOT NUMBER OF TIMES + 1
S73
S74
SHOT NUMBER OF TIMES IS SMALLER THAN 30?
NO
YES
DISPLAY ALARM 4
S75
CHANGE NUMBER OF ROTATION OF SHAFT INTO 15000min-1
S76
END OF LEVEL CHECK
TO STEP S64

FIG. 56

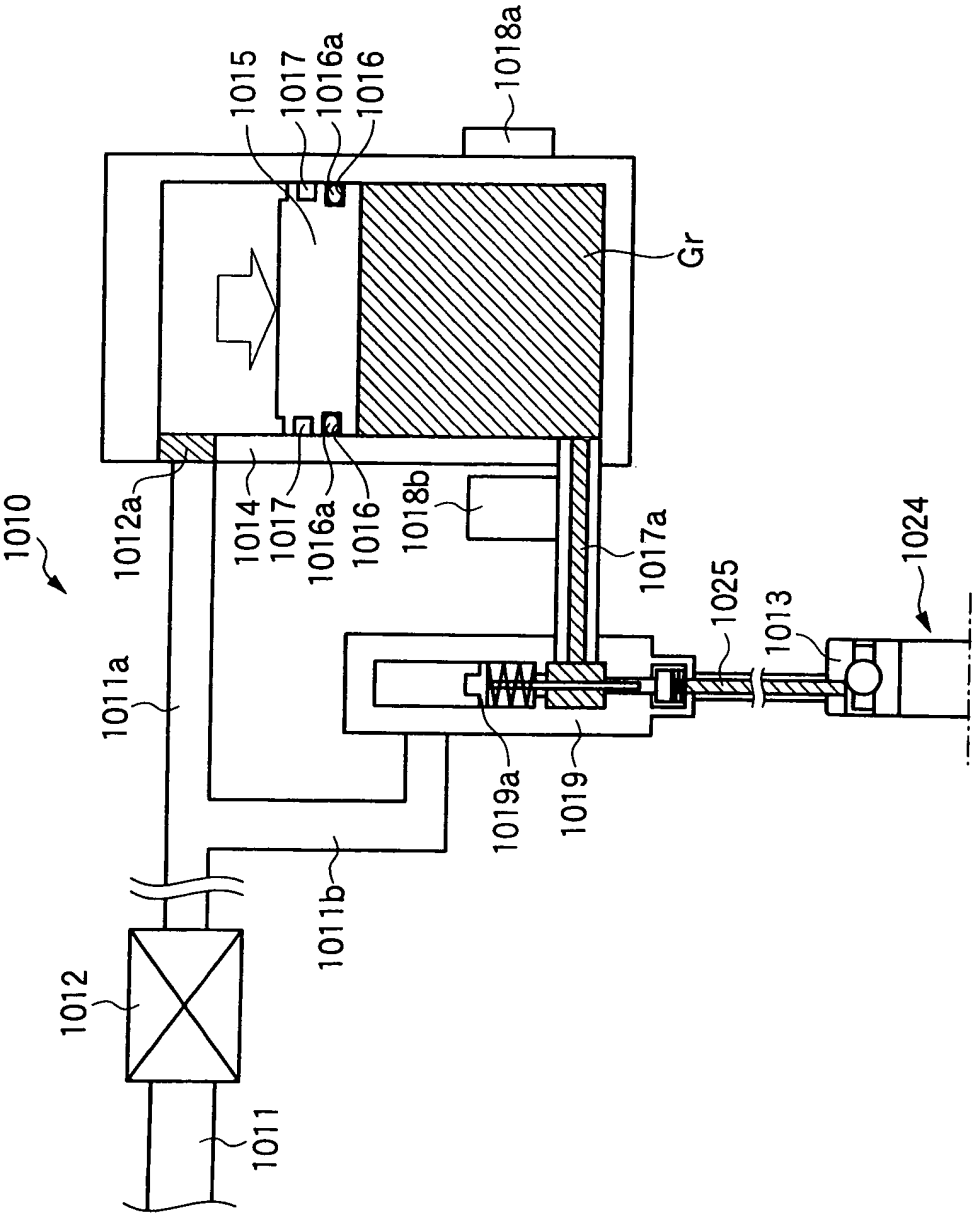

1010
1011
1011a
1011b
1012
1012a
1013
1014
1015
1016
1016a
1017
1017a
1018a
1018b
1019
1019a
1024
1025
Gr

FIG. 57

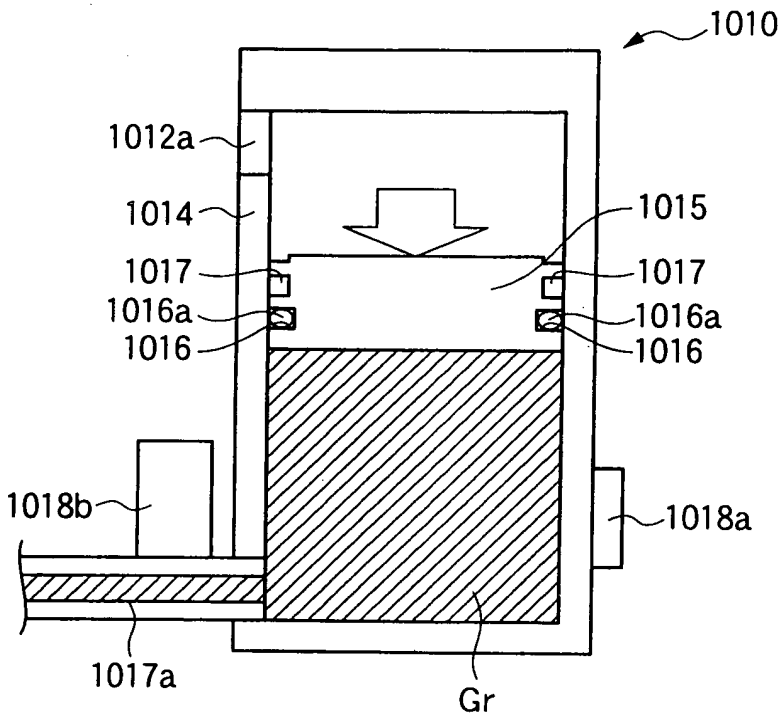

1010
1012a
1014
1015
1017
1017
1016a
1016a
1016
1016
1018b
1018a
1017a
Gr

FIG. 58

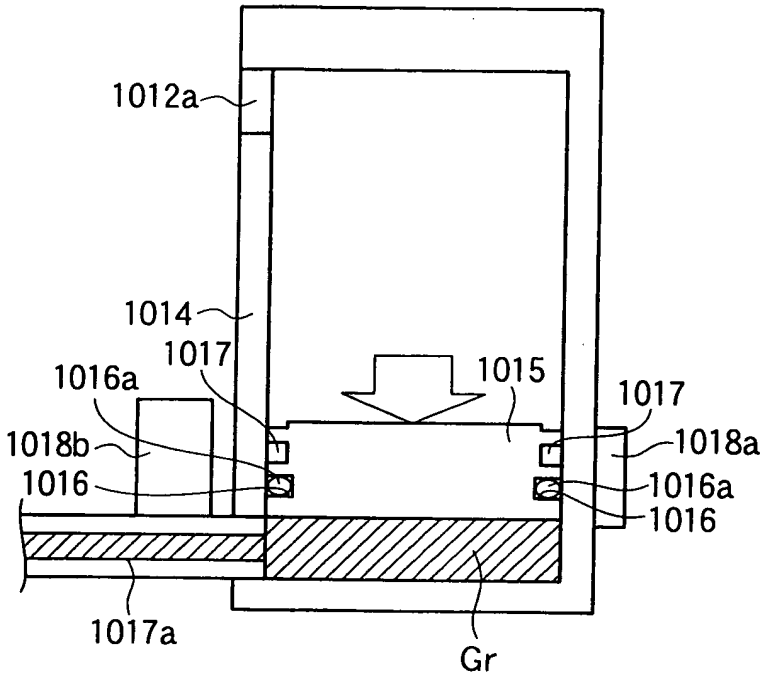

1012a
1014
1017
1016a
1015
1017
1018b
1018a
1016
1016a
1016
1017a
Gr

FIG. 59

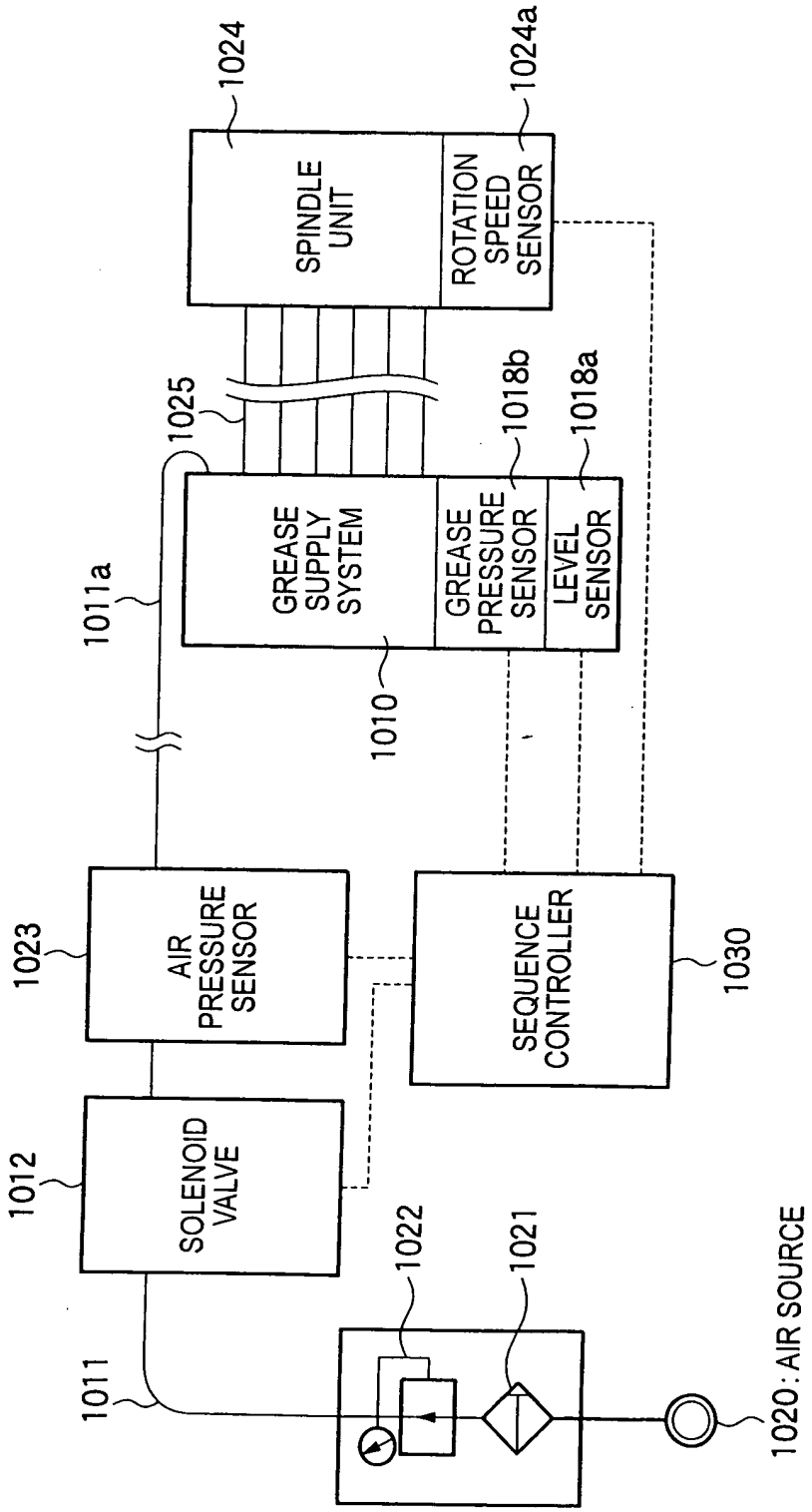

1024
SPINDLE UNIT
1024a
ROTATION SPEED SENSOR
1025
1018b
1018a
GREASE SUPPLY SYSTEM
GREASE PRESSURE SENSOR
LEVEL SENSOR
1011a
1010
1023
AIR PRESSURE SENSOR
SEQUENCE CONTROLLER
1030
1012
SOLENOID VALVE
1022
1021
1011
1020: AIR SOURCE

FIG. 60

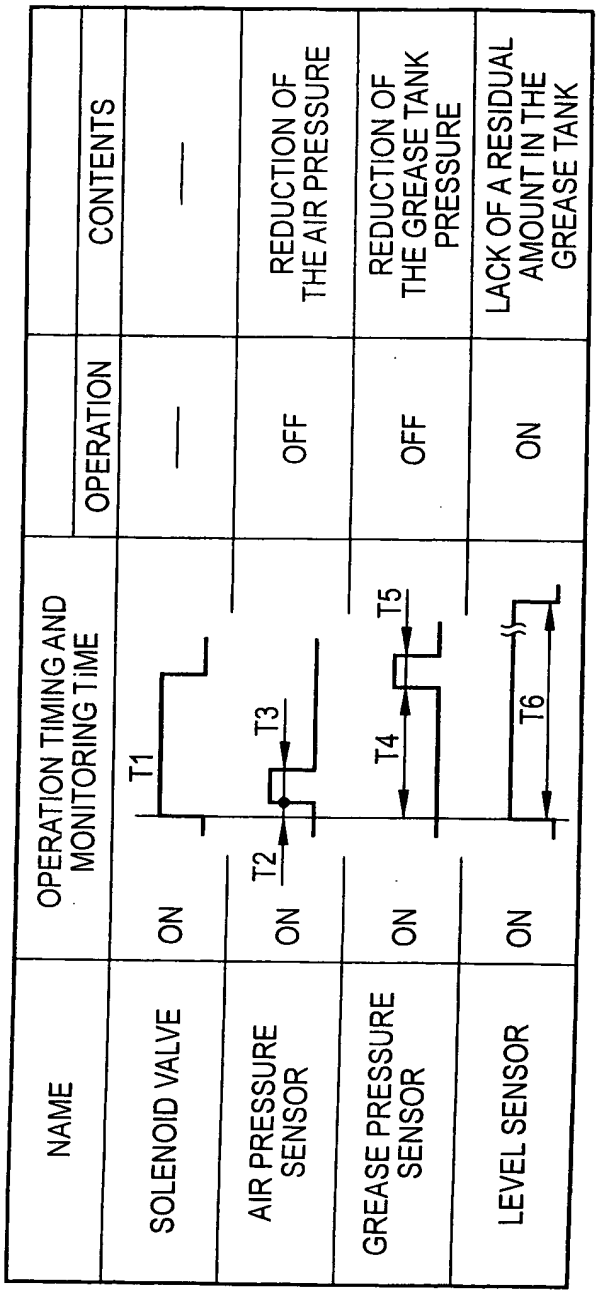

NAME
OPERATION TIMING AND MONITORING TIME
OPERATION
CONTENTS
SOLENOID VALVE
ON
—
—
AIR PRESSURE SENSOR
ON
OFF
REDUCTION OF THE AIR PRESSURE
GREASE PRESSURE SENSOR
ON
OFF
REDUCTION OF THE GREASE TANK PRESSURE
LEVEL SENSOR
ON
ON
LACK OF A RESIDUAL AMOUNT IN THE GREASE TANK
T1
T2
T3
T4
T5
T6

FIG. 61

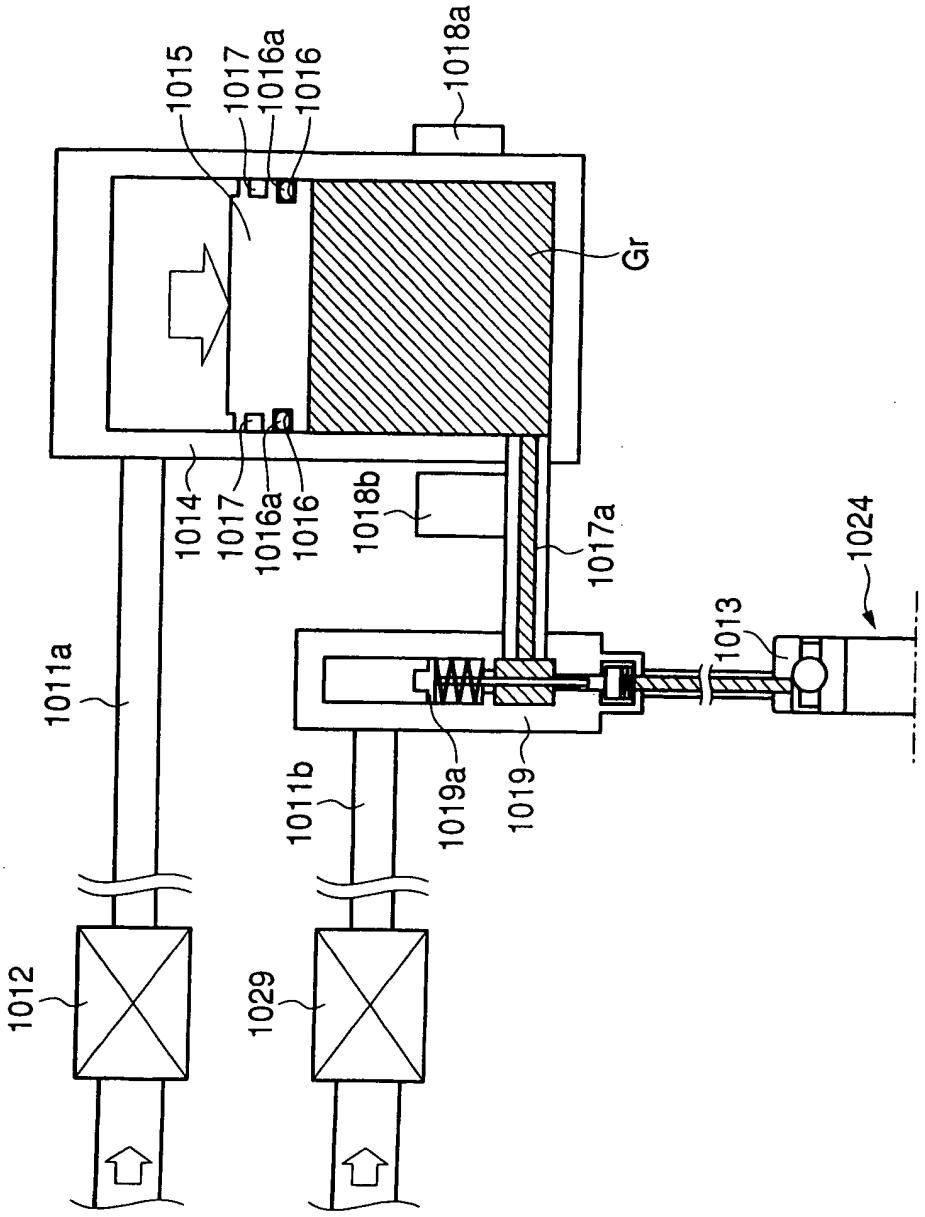

1015
1017
1016a
1016
1018a
Gr
1014
1017
1016a
1016
1018b
1017a
1024
1013
1011a
1011b
1019a
1019
1012
1029

FIG. 62

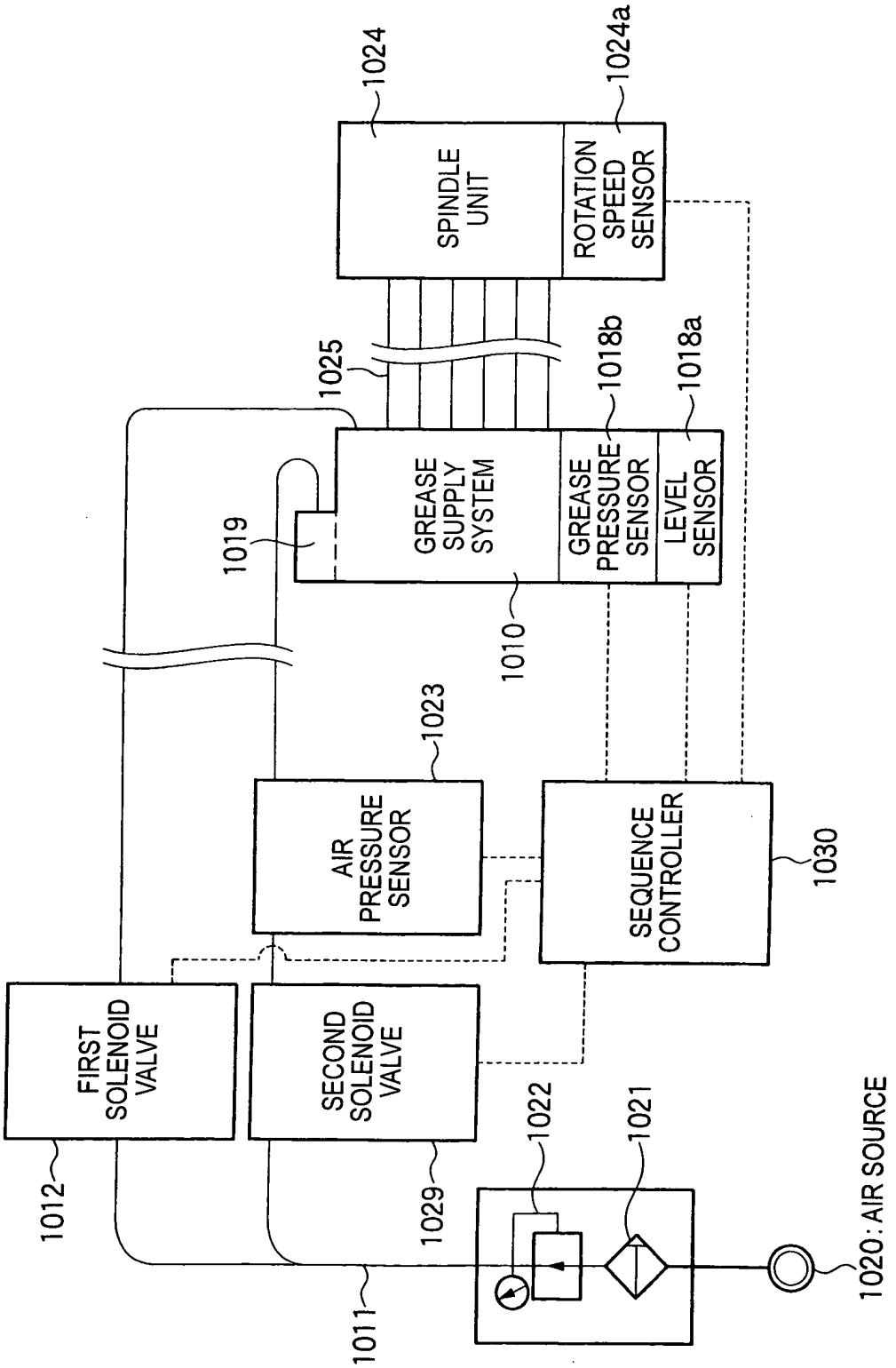

1024
1024a
SPINDLE UNIT
ROTATION SPEED SENSOR
1025
1018b
1018a
GREASE SUPPLY SYSTEM
GREASE PRESSURE SENSOR
LEVEL SENSOR
1019
1010
1023
AIR PRESSURE SENSOR
SEQUENCE CONTROLLER
1030
FIRST SOLENOID VALVE
SECOND SOLENOID VALVE
1012
1029
1022
1021
1011
1020: AIR SOURCE

FIG. 63

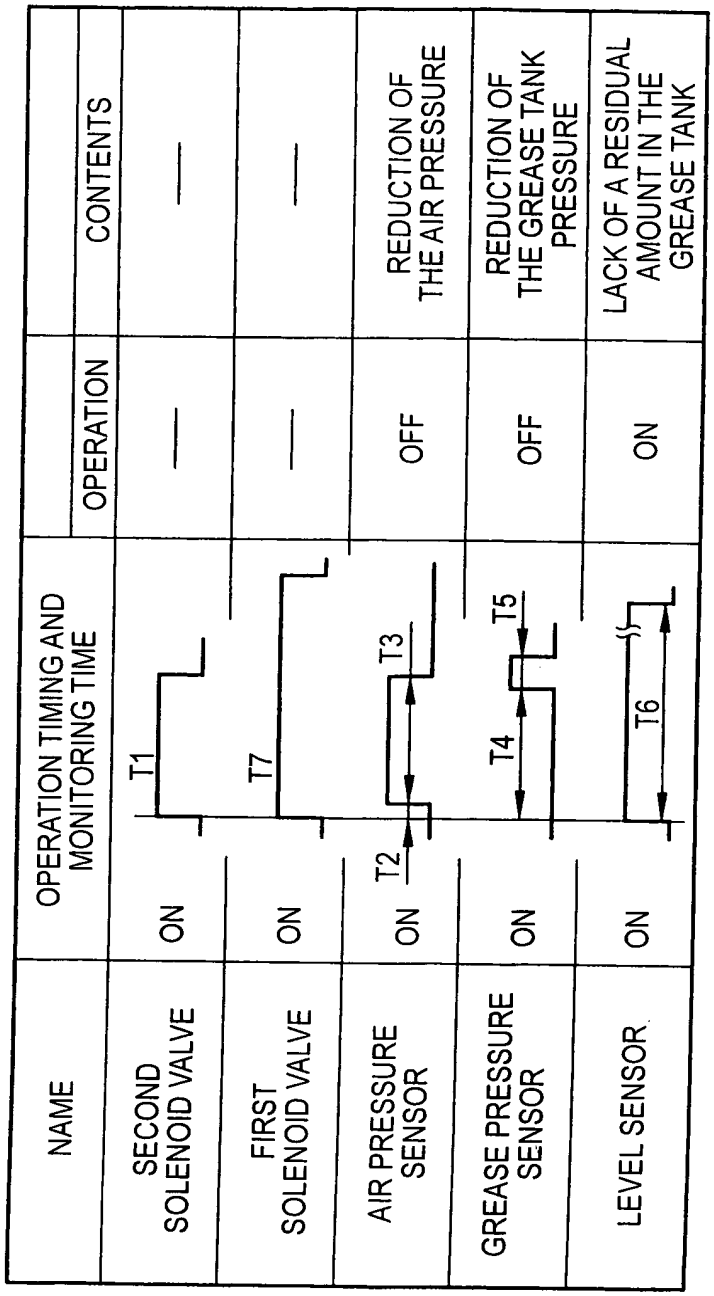

NAME
OPERATION TIMING AND MONITORING TIME
OPERATION
CONTENTS
SECOND SOLENOID VALVE
ON
—
—
FIRST SOLENOID VALVE
ON
—
—
AIR PRESSURE SENSOR
ON
OFF
REDUCTION OF THE AIR PRESSURE
GREASE PRESSURE SENSOR
ON
OFF
REDUCTION OF THE GREASE TANK PRESSURE
LEVEL SENSOR
ON
ON
LACK OF A RESIDUAL AMOUNT IN THE GREASE TANK
T1
T2
T3
T4
T5
T6
T7

FIG. 64

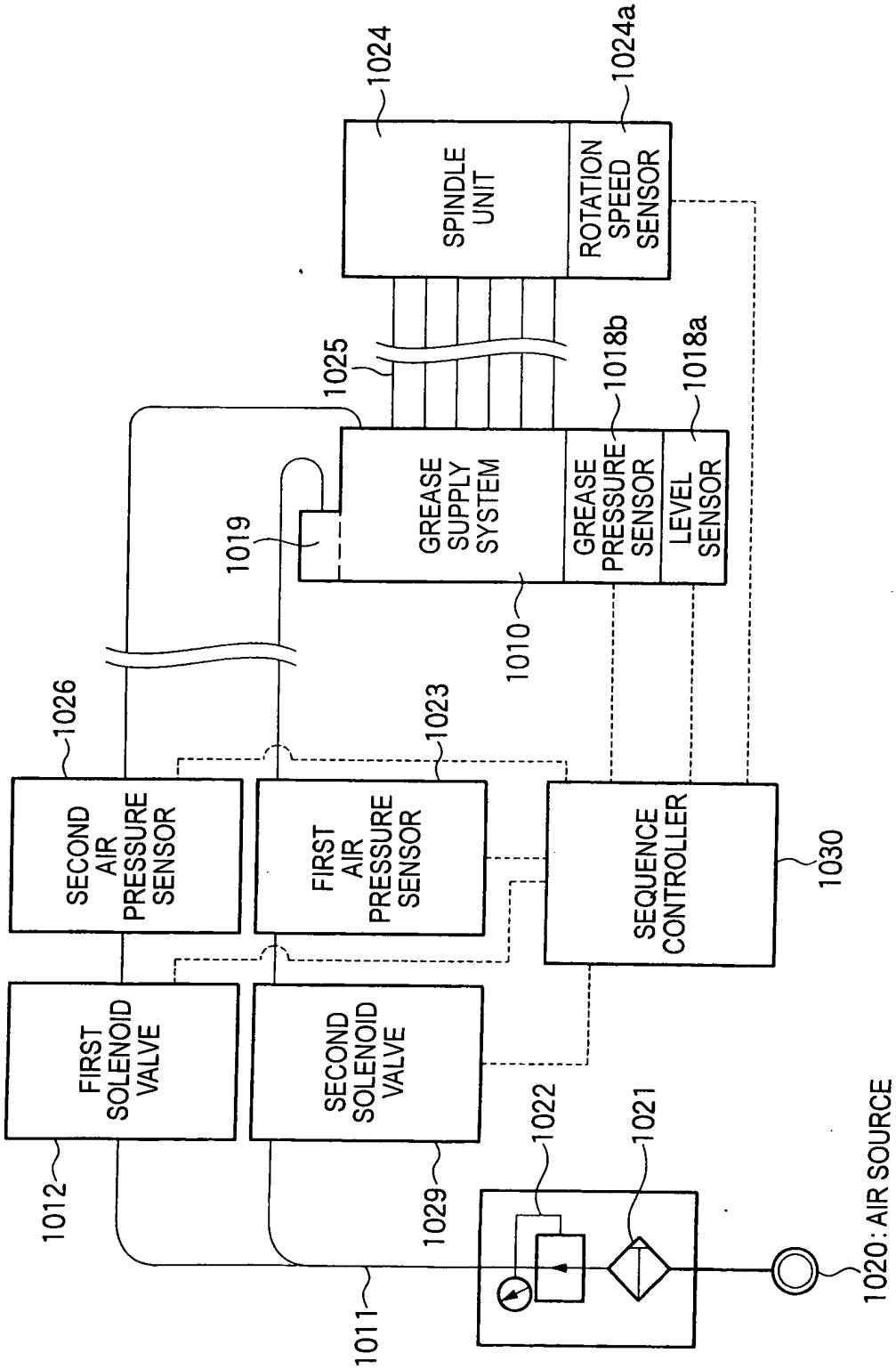

1024
1024a
SPINDLE UNIT
ROTATION SPEED SENSOR
1025
1018b
1018a
GREASE SUPPLY SYSTEM
GREASE PRESSURE SENSOR
LEVEL SENSOR
1019
1010
1026
1023
SECOND AIR PRESSURE SENSOR
FIRST AIR PRESSURE SENSOR
SEQUENCE CONTROLLER
1030
FIRST SOLENOID VALVE
SECOND SOLENOID VALVE
1022
1021
1012
1029
1011
1020: AIR SOURCE

FIG. 65

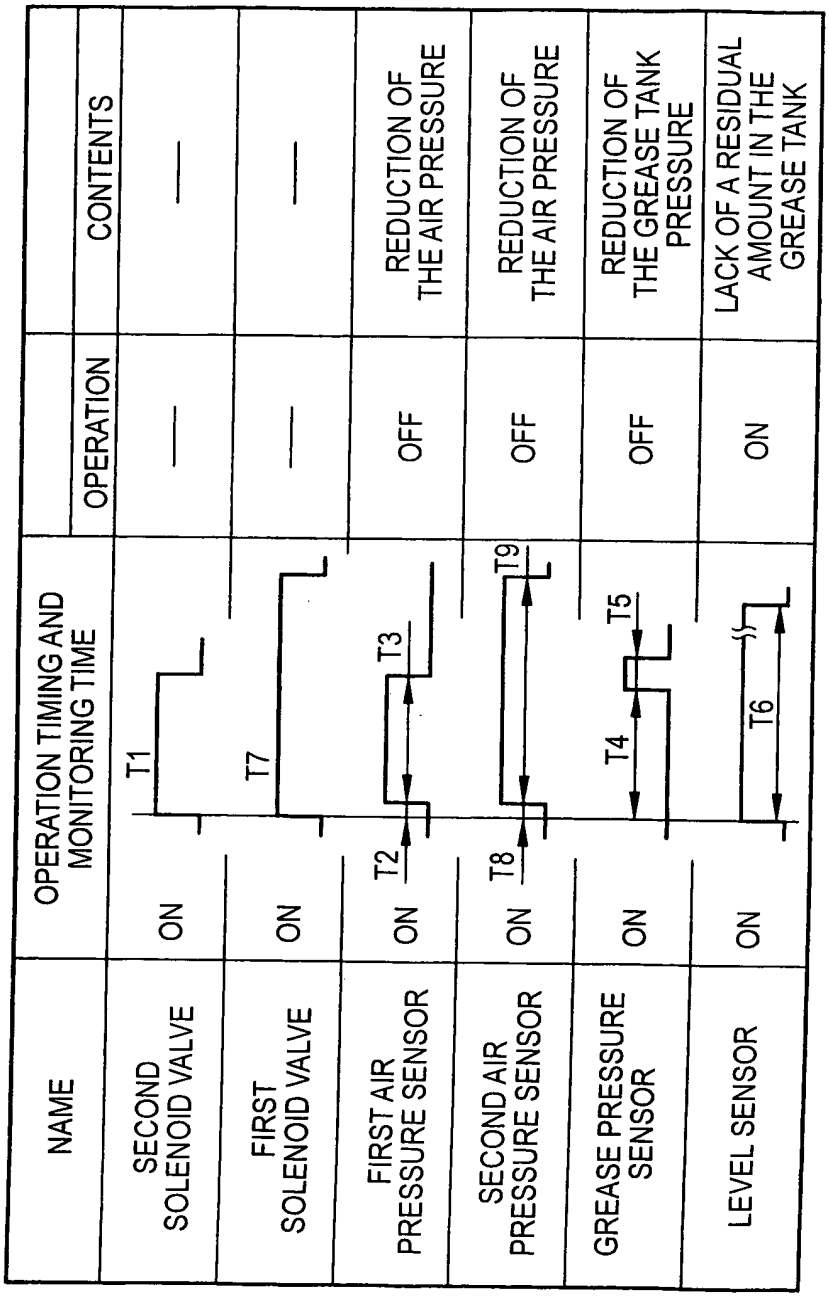

NAME
OPERATION TIMING AND MONITORING TIME
OPERATION
CONTENTS
SECOND SOLENOID VALVE
ON
—
—
FIRST SOLENOID VALVE
ON
—
—
FIRST AIR PRESSURE SENSOR
ON
OFF
REDUCTION OF THE AIR PRESSURE
SECOND AIR PRESSURE SENSOR
ON
OFF
REDUCTION OF THE AIR PRESSURE
GREASE PRESSURE SENSOR
ON
OFF
REDUCTION OF THE GREASE TANK PRESSURE
LEVEL SENSOR
ON
ON
LACK OF A RESIDUAL AMOUNT IN THE GREASE TANK
T1
T2
T3
T4
T5
T6
T7
T8
T9

FIG. 66

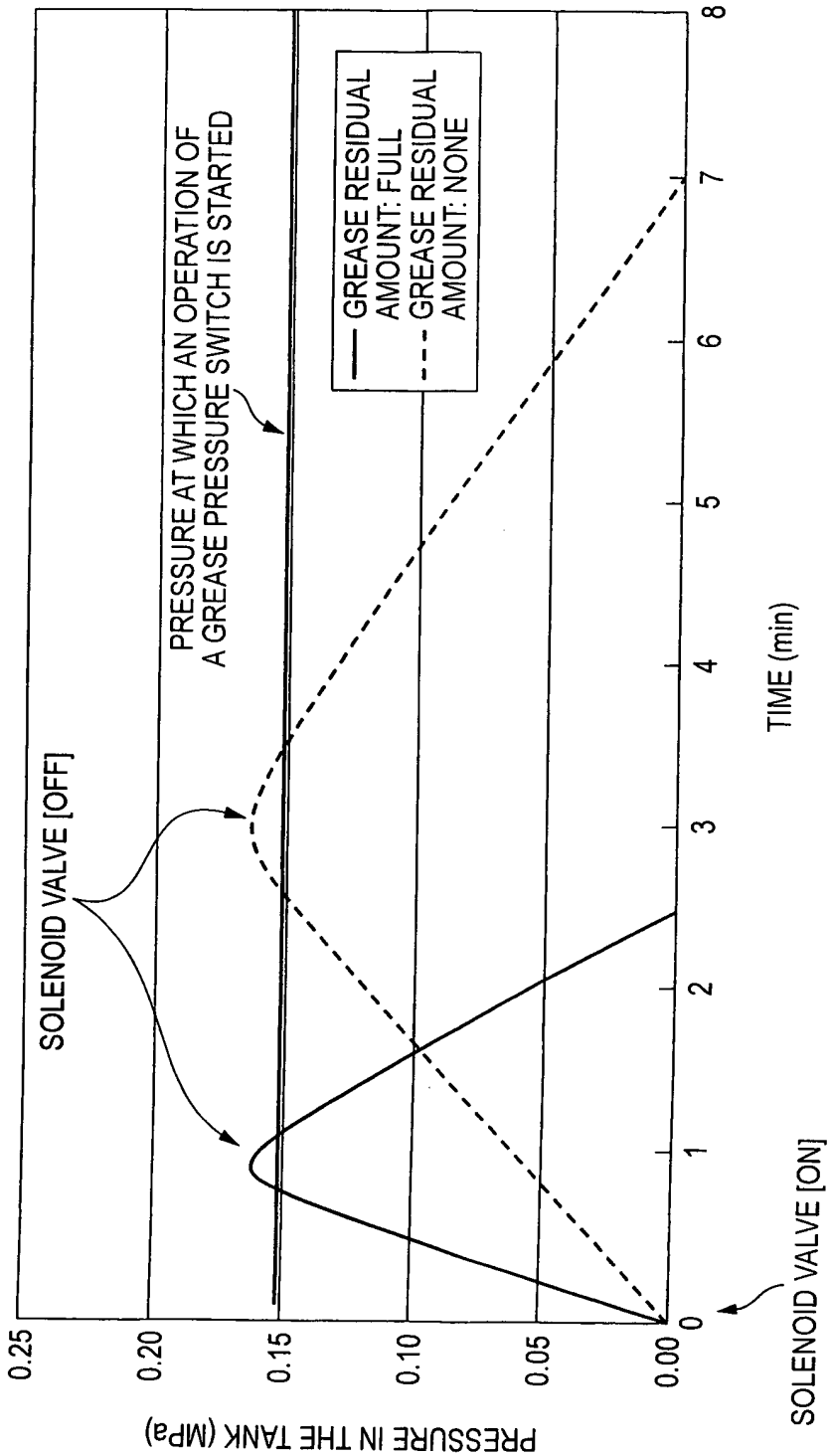

PRESSURE IN THE TANK (MPa)
0.25
0.20
0.15
0.10
0.05
0.00
0
1
2
3
4
5
6
7
8
TIME (min)
SOLENOID VALVE [ON]
SOLENOID VALVE [OFF]
PRESSURE AT WHICH AN OPERATION OF A GREASE PRESSURE SWITCH IS STARTED
GREASE RESIDUAL AMOUNT: FULL
GREASE RESIDUAL AMOUNT: NONE

FIG. 67

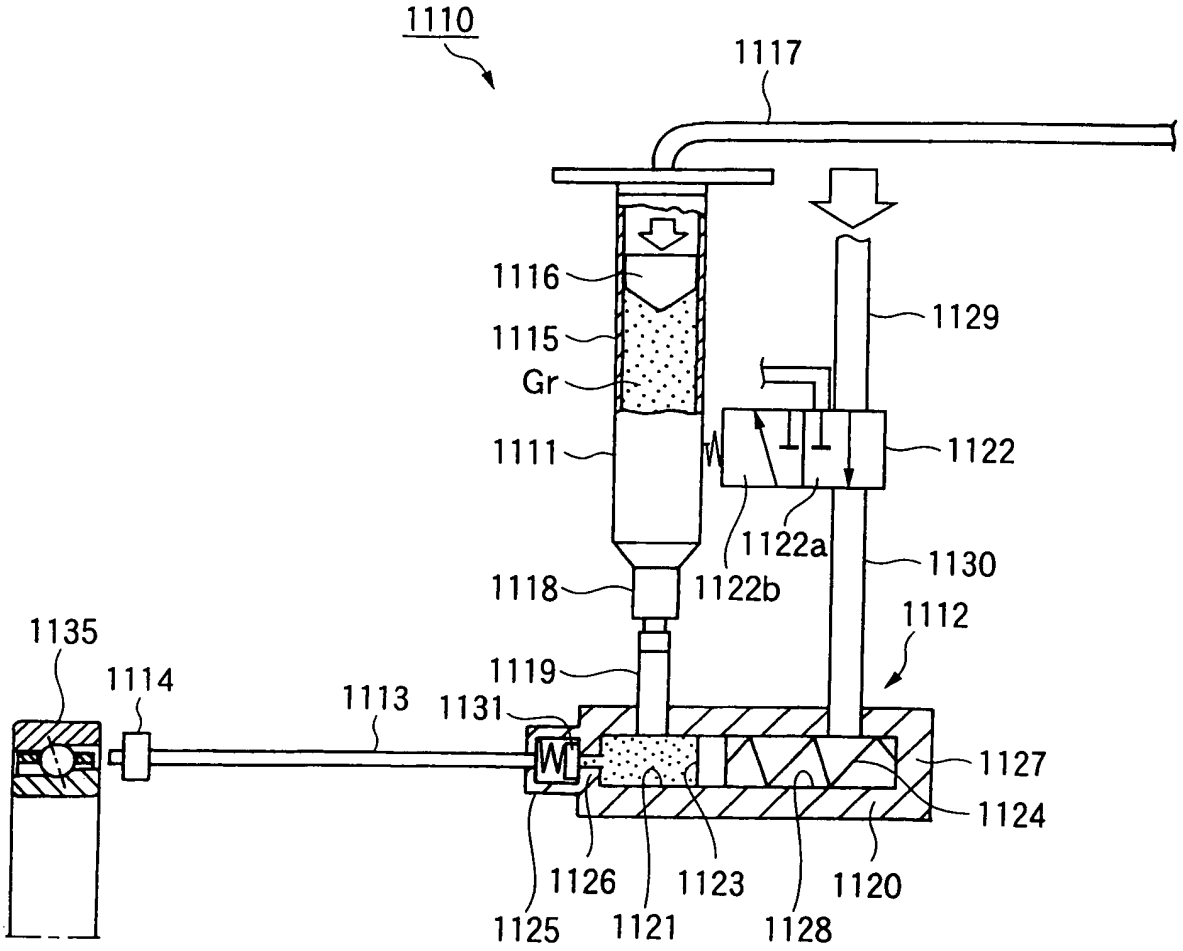

1110
1117
1116
1115
Gr
1111
1129
1122
1122a
1130
1118
1122b
1112
1135
1114
1119
1113
1131
W
1127
1124
1126
1123
1120
1125
1121
1128

FIG. 68

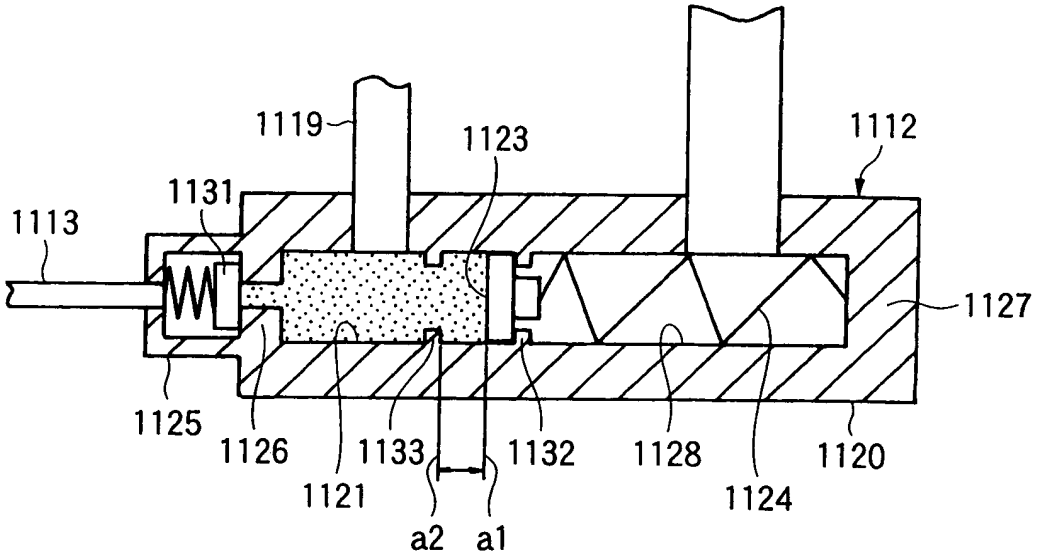

1119
1123
1112
1131
1113
1127
1125
1126
1133
1132
1128
1120
1121
1124
a2
a1

FIG. 69

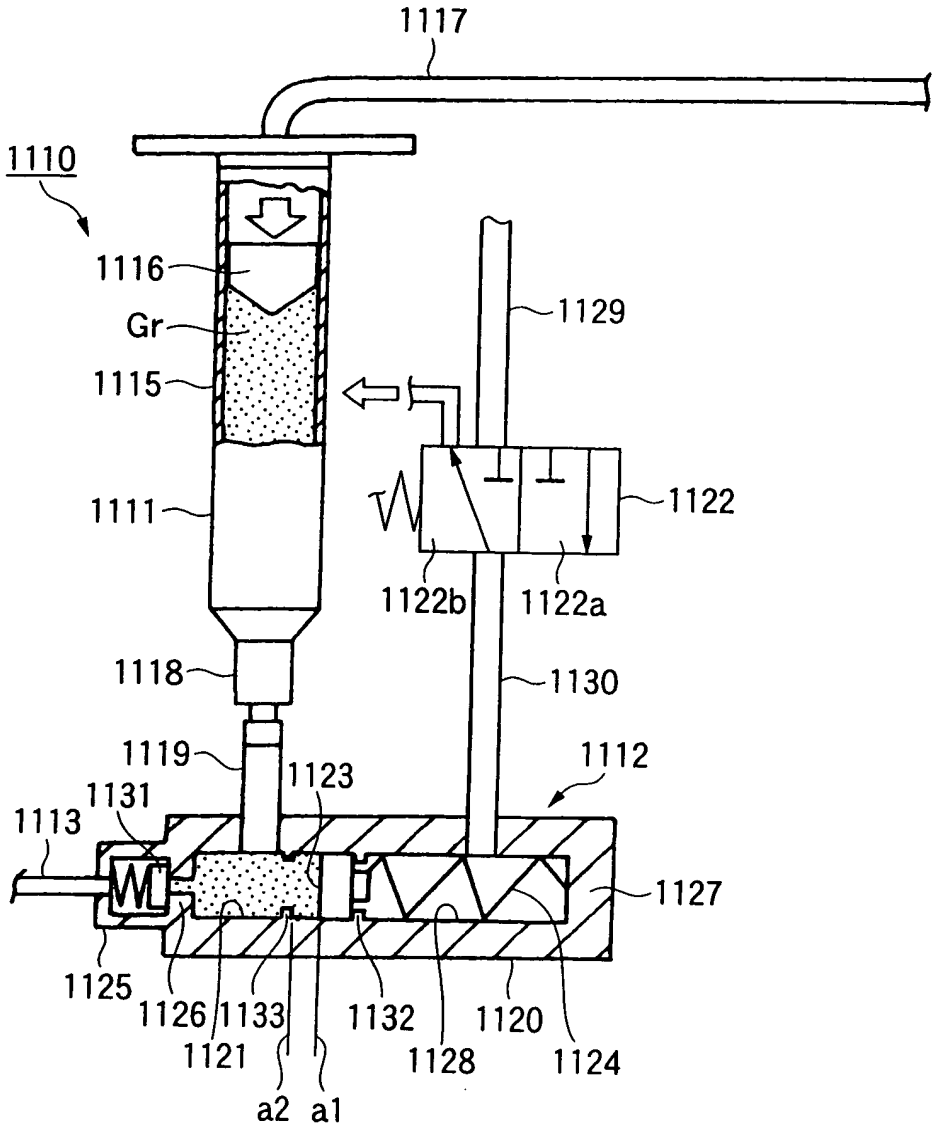

1117
1110
1116
Gr
1115
1111
1129
1122
1122b
1122a
1118
1130
1119
1123
1112
1131
1113
1127
1125
1126
1133
1132
1120
1121
1128
1124
a2
a1

FIG. 70

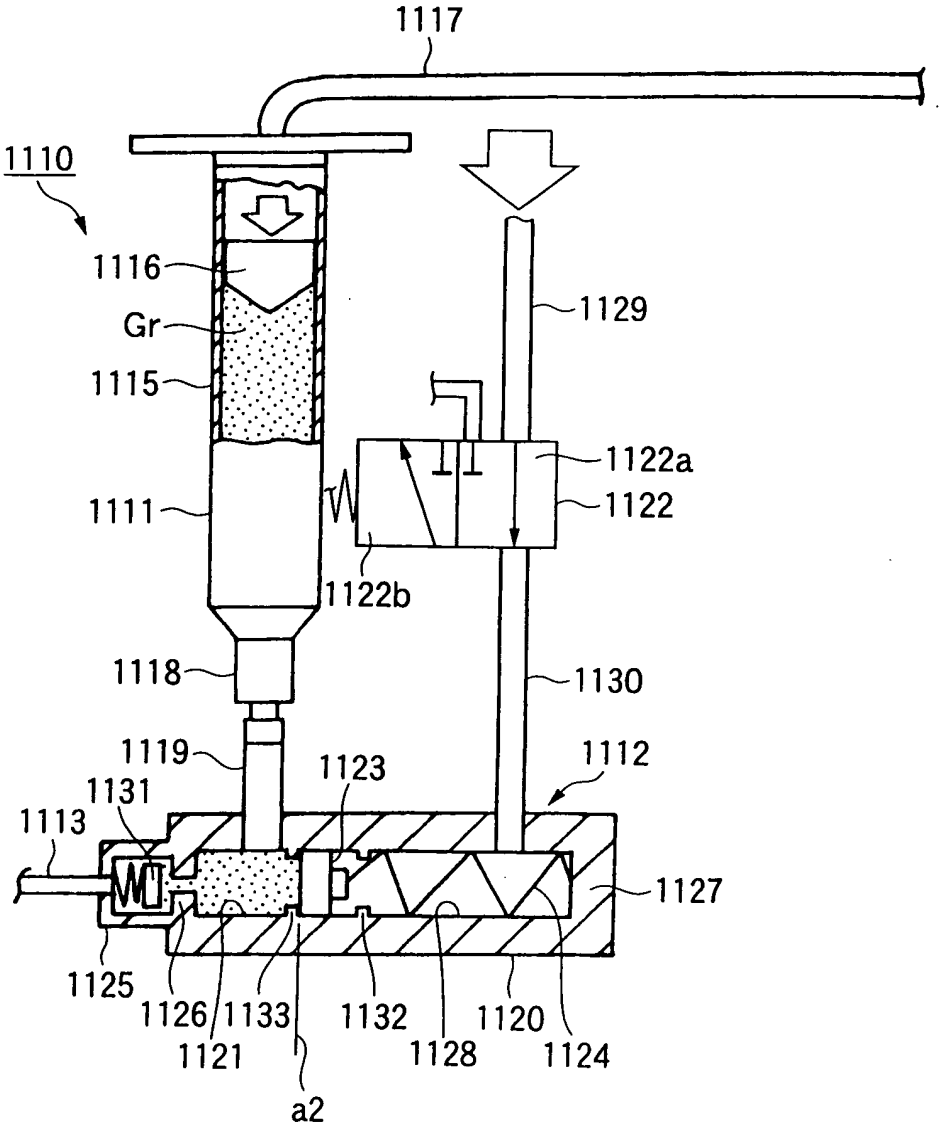

1117
1110
1116
Gr
1115
1111
1129
1122a
1122
1122b
1118
1130
1119
1123
1112
1131
1113
1127
1125
1126
1133
1132
1120
1121
1128
1124
a2

FIG. 71

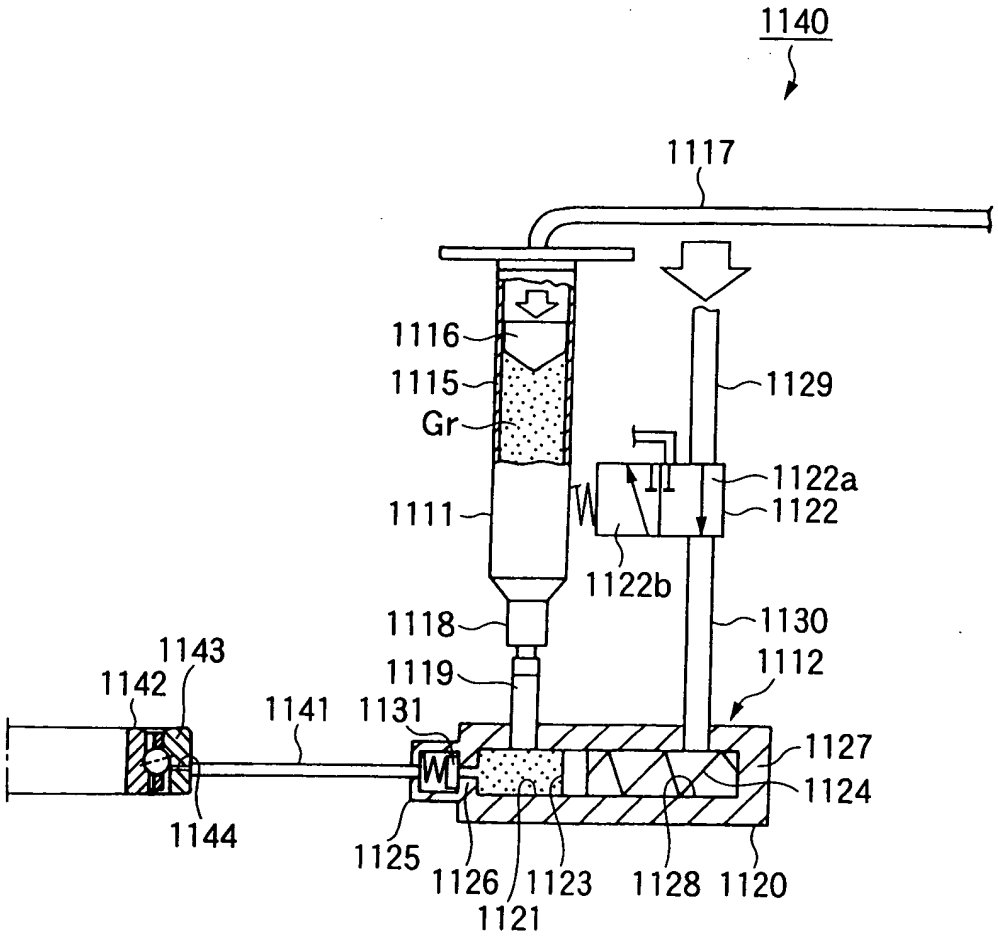

1140
1117
1116
1115
Gr
1111
1129
1122a
1122
1122b
1118
1130
1119
1112
1143
1142
1141
1131
1127
1124
1144
1125
1126
1123
1128
1120
1121

FIG. 72 (a)

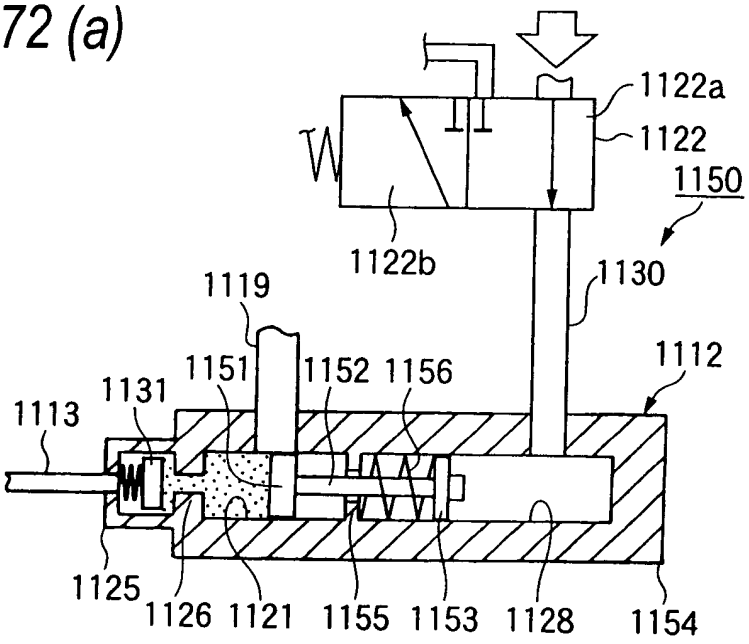


FIG. 72 (b)

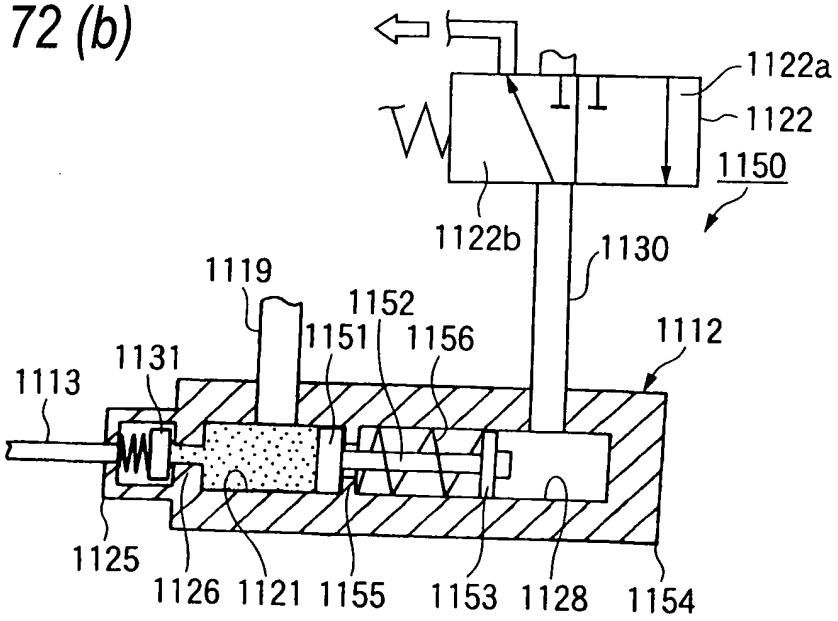


FIG. 73 (a)

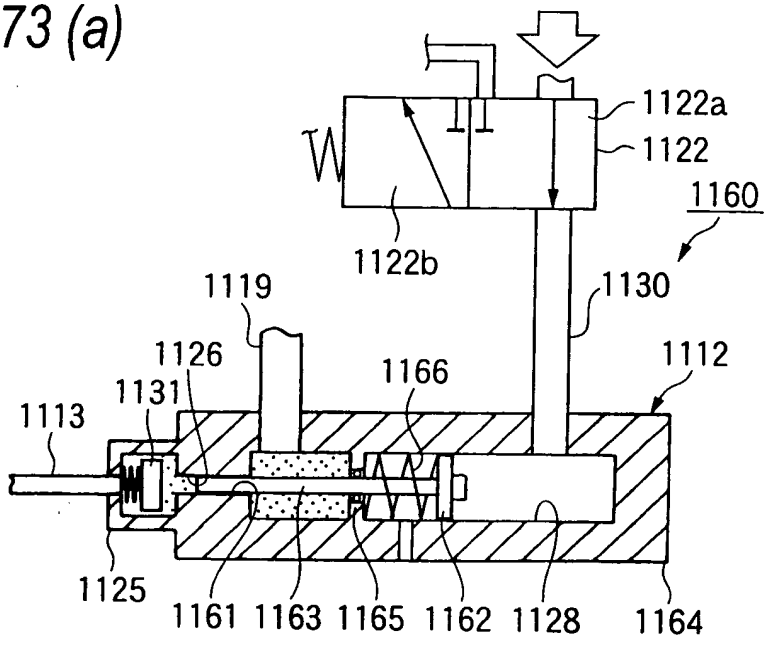


FIG. 73 (b)

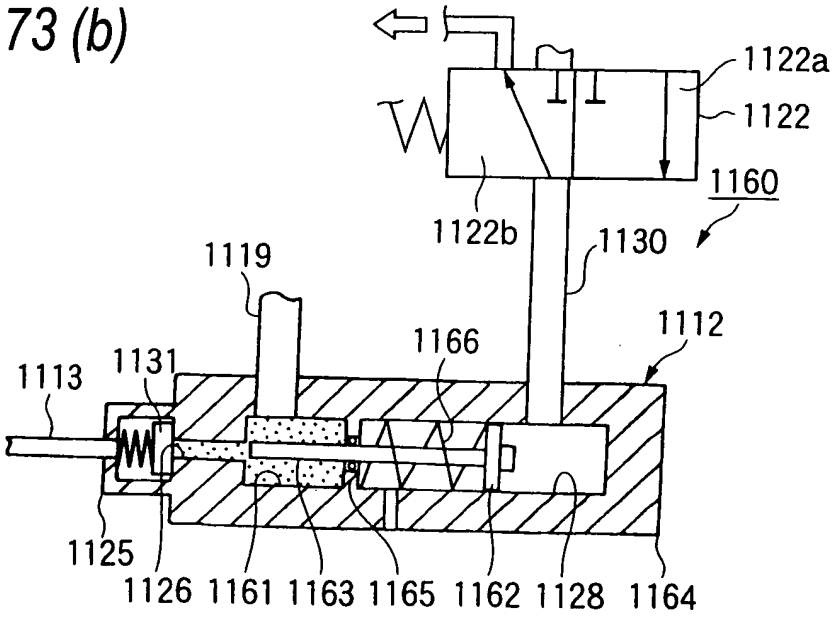


FIG. 74

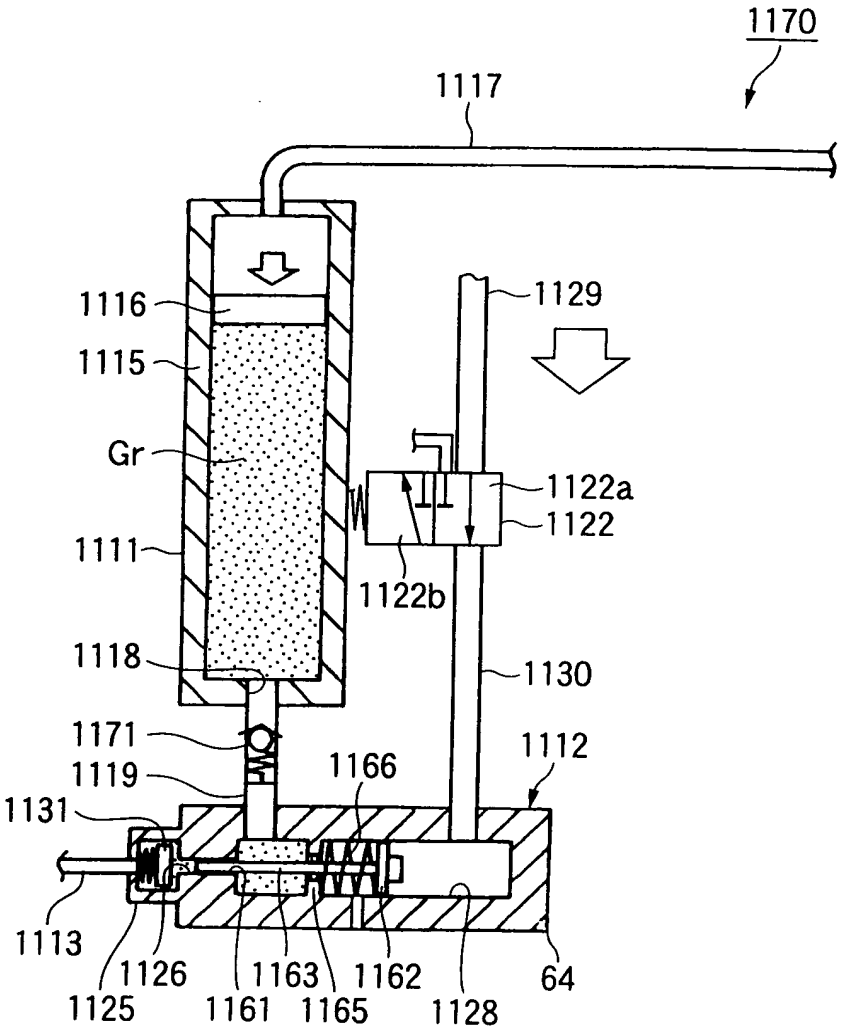

1170
1117
1116
1115
Gr
1111
1118
1171
1119
1131
1113
1125
1126
1161
1163
1165
1162
1128
64
1166
1112
1130
1129
1122a
1122
1122b

FIG. 75

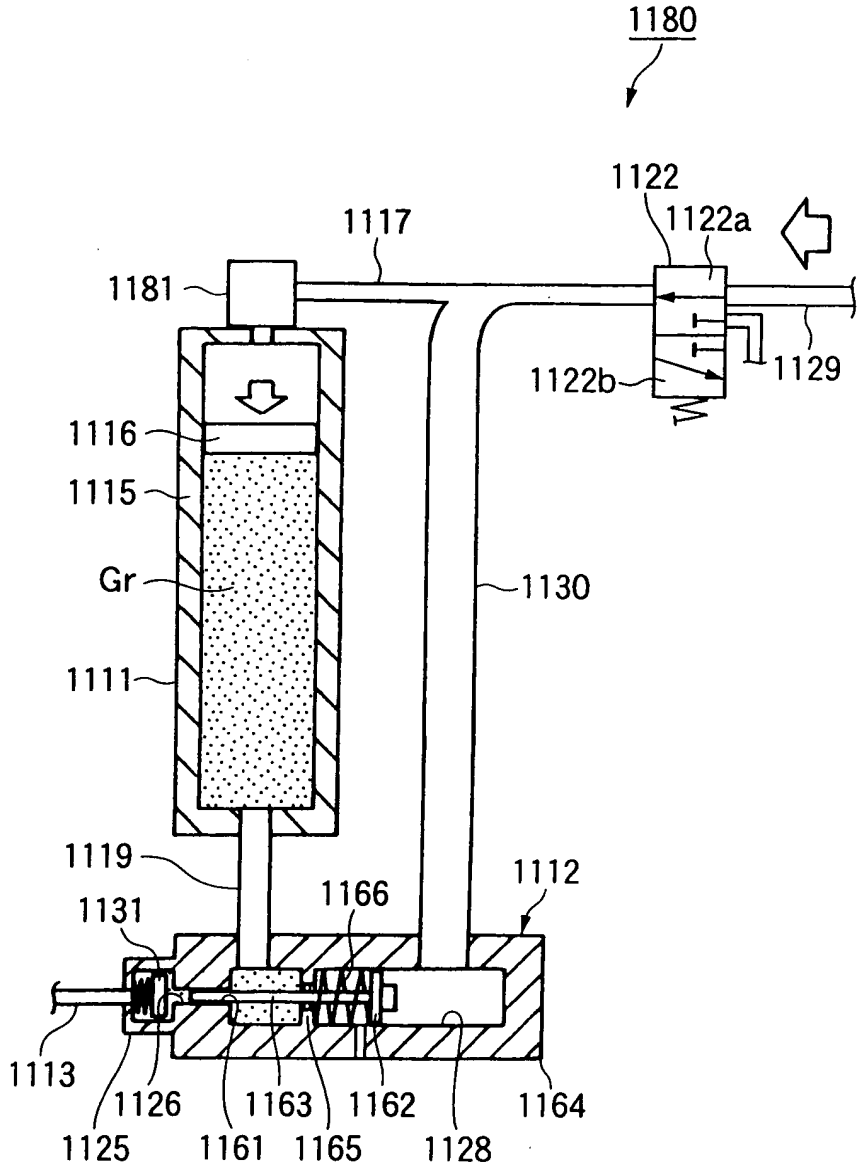

1180
1122
1122a
1117
1181
1129
1122b
1116
1115
Gr
1130
1111
1119
1112
1166
1131
1113
1126
1163
1162
1164
1125
1161
1165
1128

FIG. 76

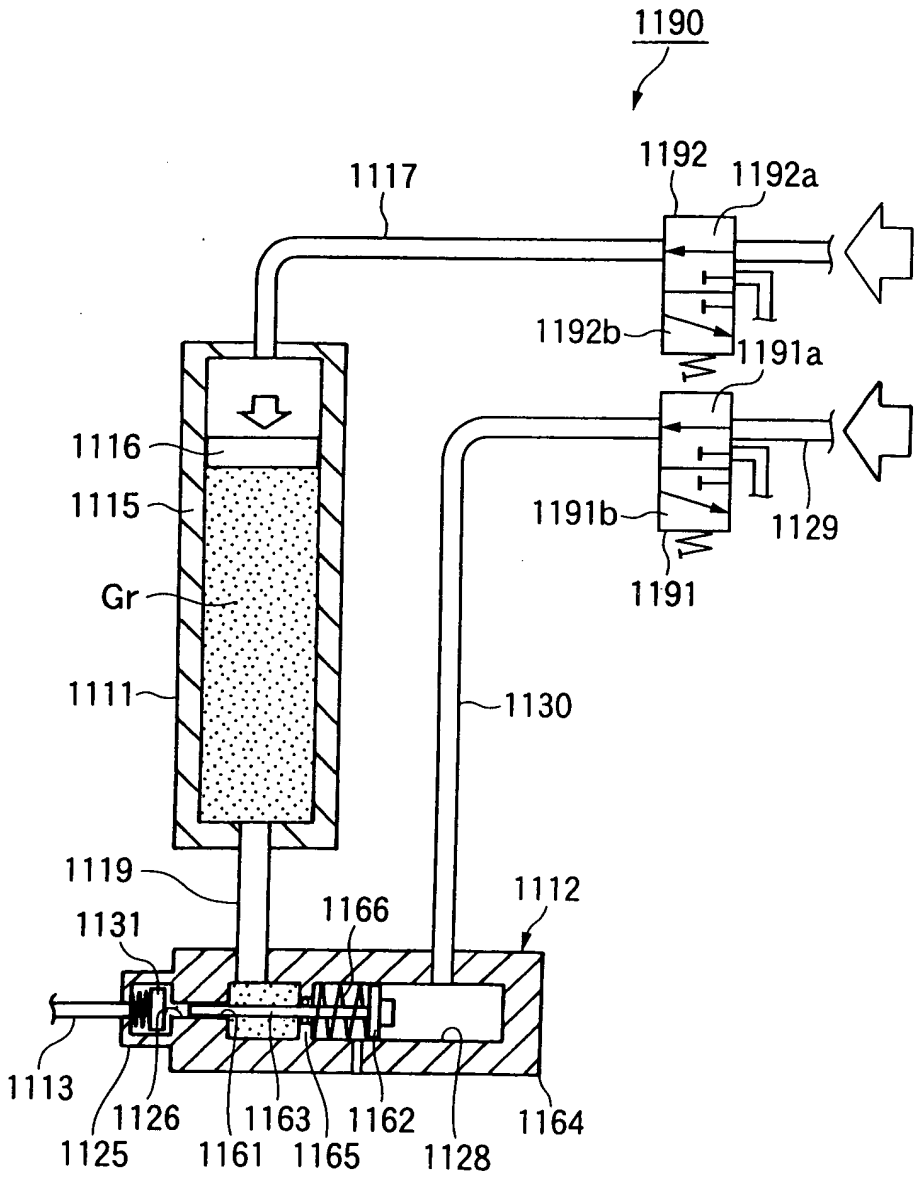

1190
1192
1192a
1117
1192b
1191a
1116
1115
1191b
1129
Gr
1191
1111
1130
1119
1112
1131
1166
1113
1126
1163
1162
1164
1125
1161
1165
1128

FIG. 77

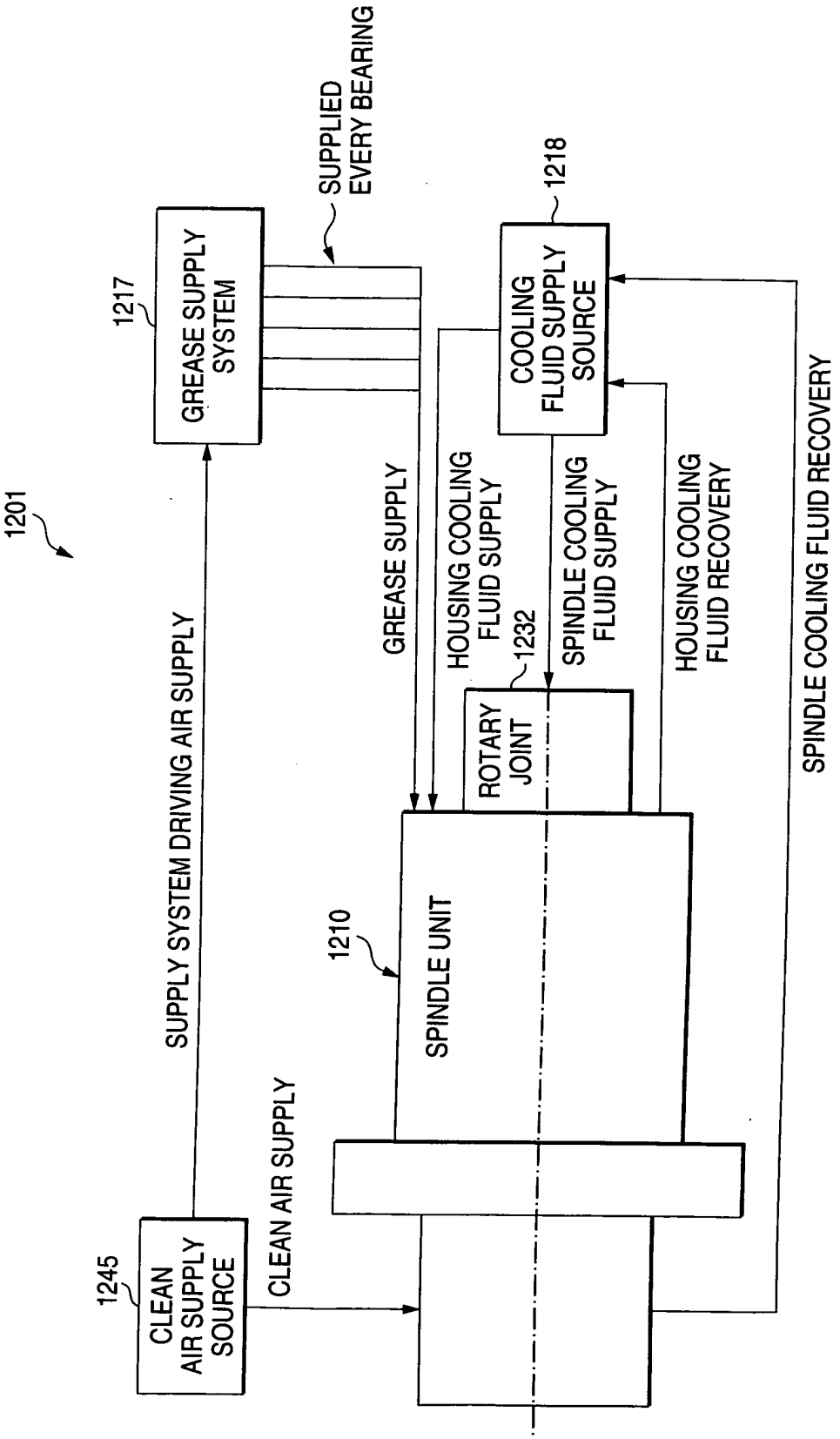

1201
1217
GREASE SUPPLY SYSTEM
SUPPLIED EVERY BEARING
1218
COOLING FLUID SUPPLY SOURCE
SUPPLY SYSTEM DRIVING AIR SUPPLY
GREASE SUPPLY
HOUSING COOLING FLUID SUPPLY
SPINDLE COOLING FLUID SUPPLY
HOUSING COOLING FLUID RECOVERY
SPINDLE COOLING FLUID RECOVERY
1232
ROTARY JOINT
1210
SPINDLE UNIT
CLEAN AIR SUPPLY
1245
CLEAN AIR SUPPLY SOURCE

FIG. 78

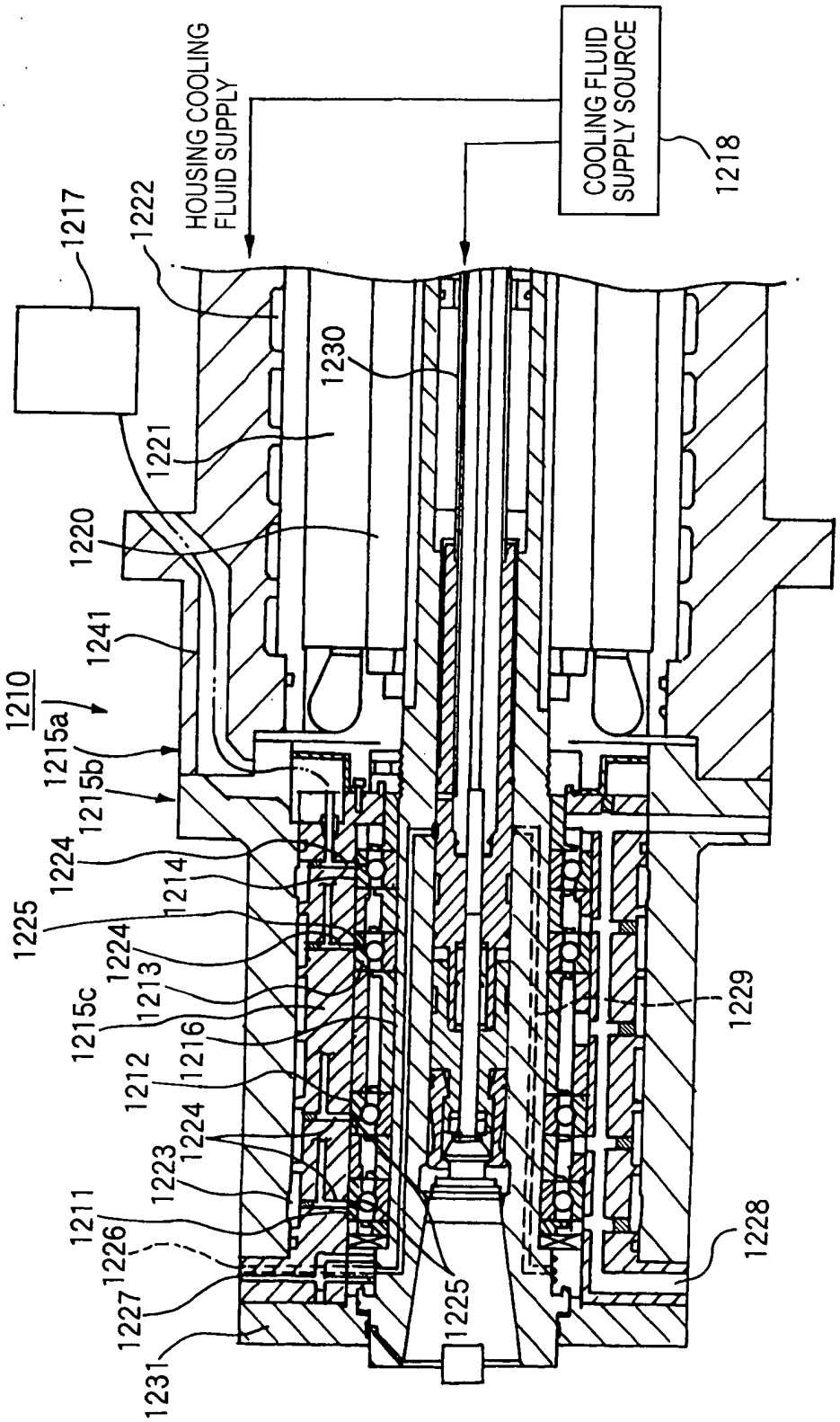

HOUSING COOLING FLUID SUPPLY
COOLING FLUID SUPPLY SOURCE
1218
1217
1222
1230
1221
1220
1241
1210
1215a
1215b
1224
1214
1225
1224
1213
1215c
1216
1212
1224
1223
1211
1226
1227
1231
1225
1229
1228

FIG. 79

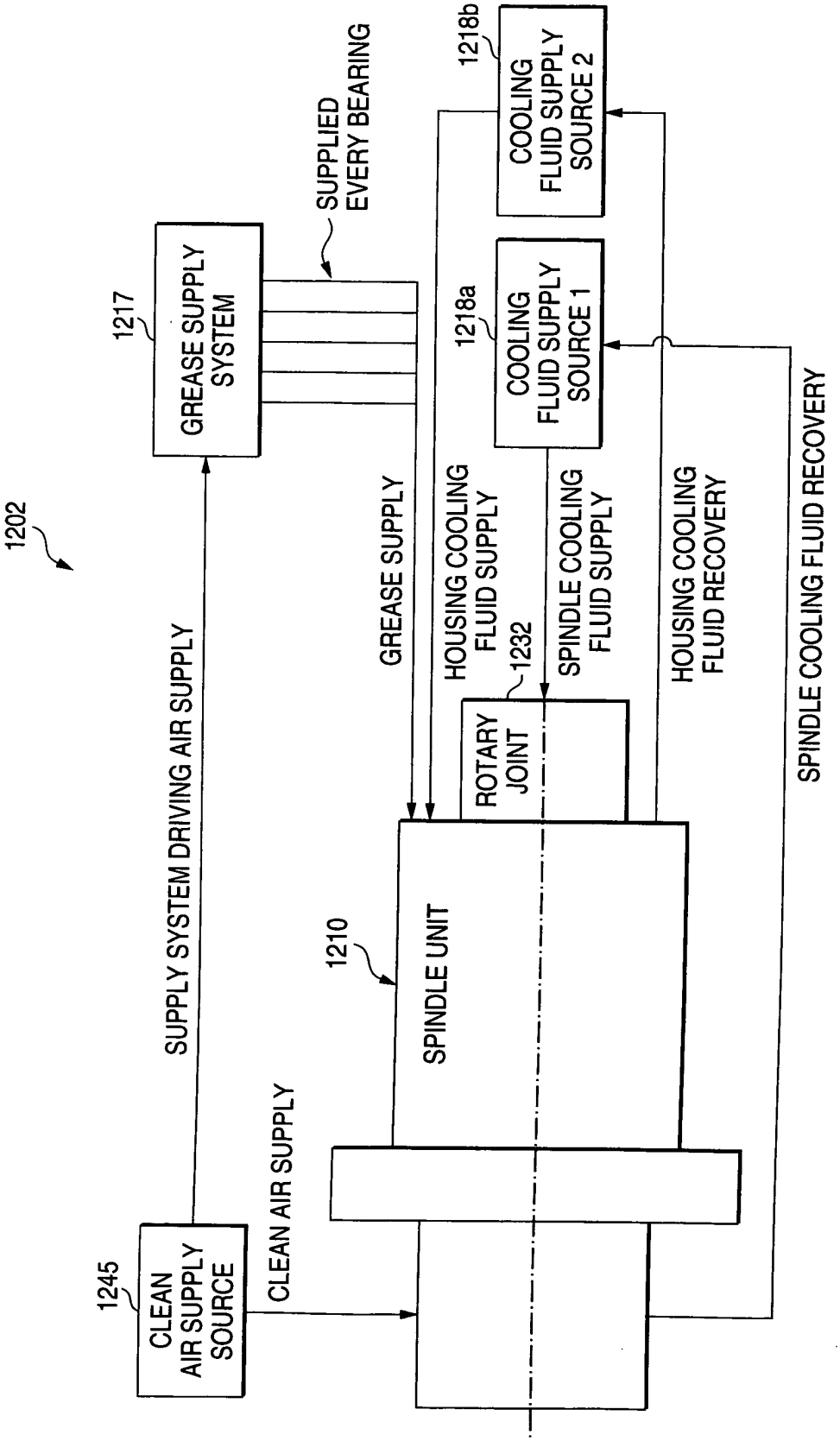

1202
1217
GREASE SUPPLY SYSTEM
SUPPLIED EVERY BEARING
1218b
COOLING FLUID SUPPLY SOURCE 2
1218a
COOLING FLUID SUPPLY SOURCE 1
GREASE SUPPLY
HOUSING COOLING FLUID SUPPLY
SPINDLE COOLING FLUID SUPPLY
HOUSING COOLING FLUID RECOVERY
SPINDLE COOLING FLUID RECOVERY
1232
ROTARY JOINT
SUPPLY SYSTEM DRIVING AIR SUPPLY
1210
SPINDLE UNIT
CLEAN AIR SUPPLY
1245
CLEAN AIR SUPPLY SOURCE

FIG. 80

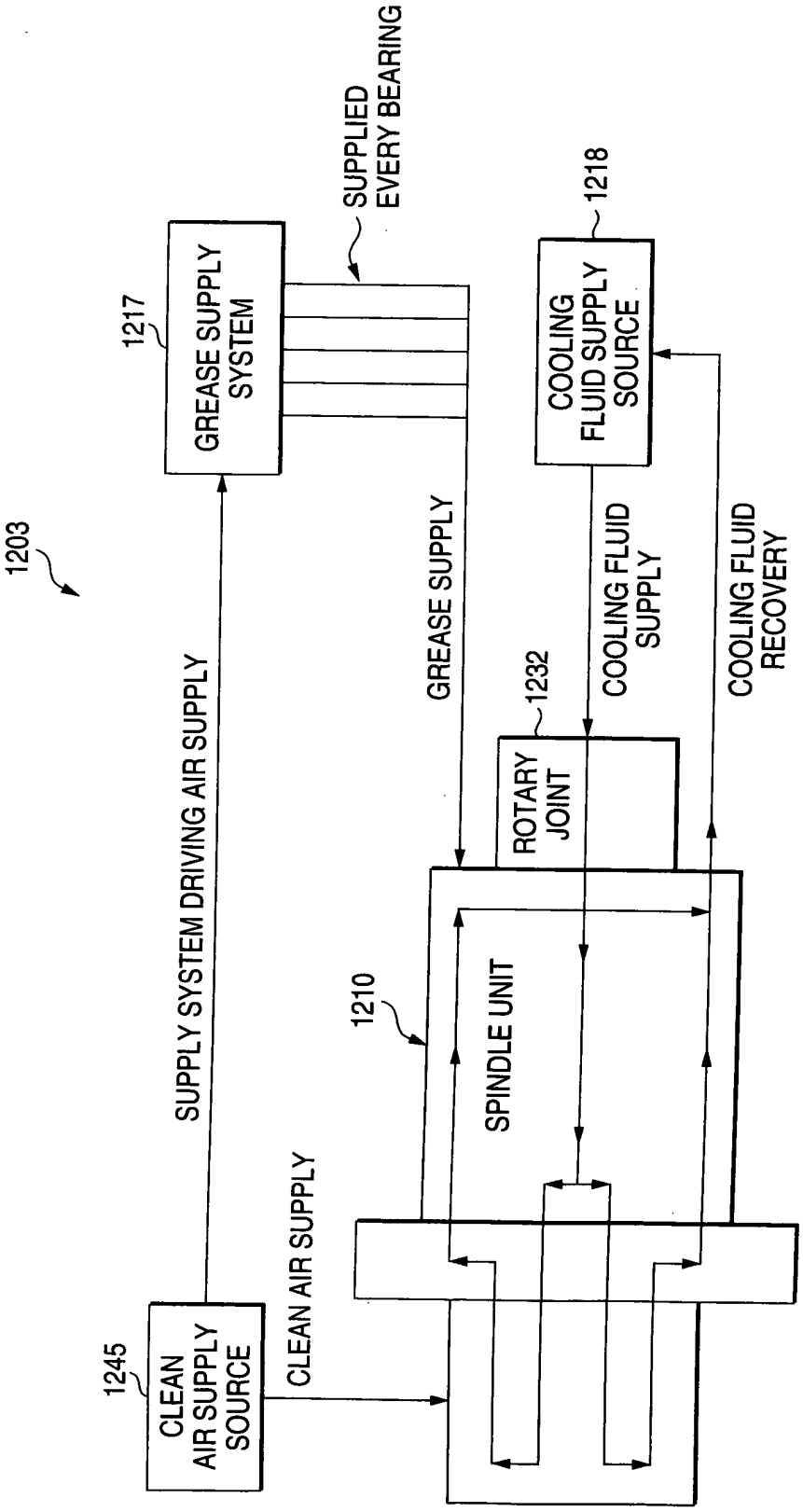


FIG. 81

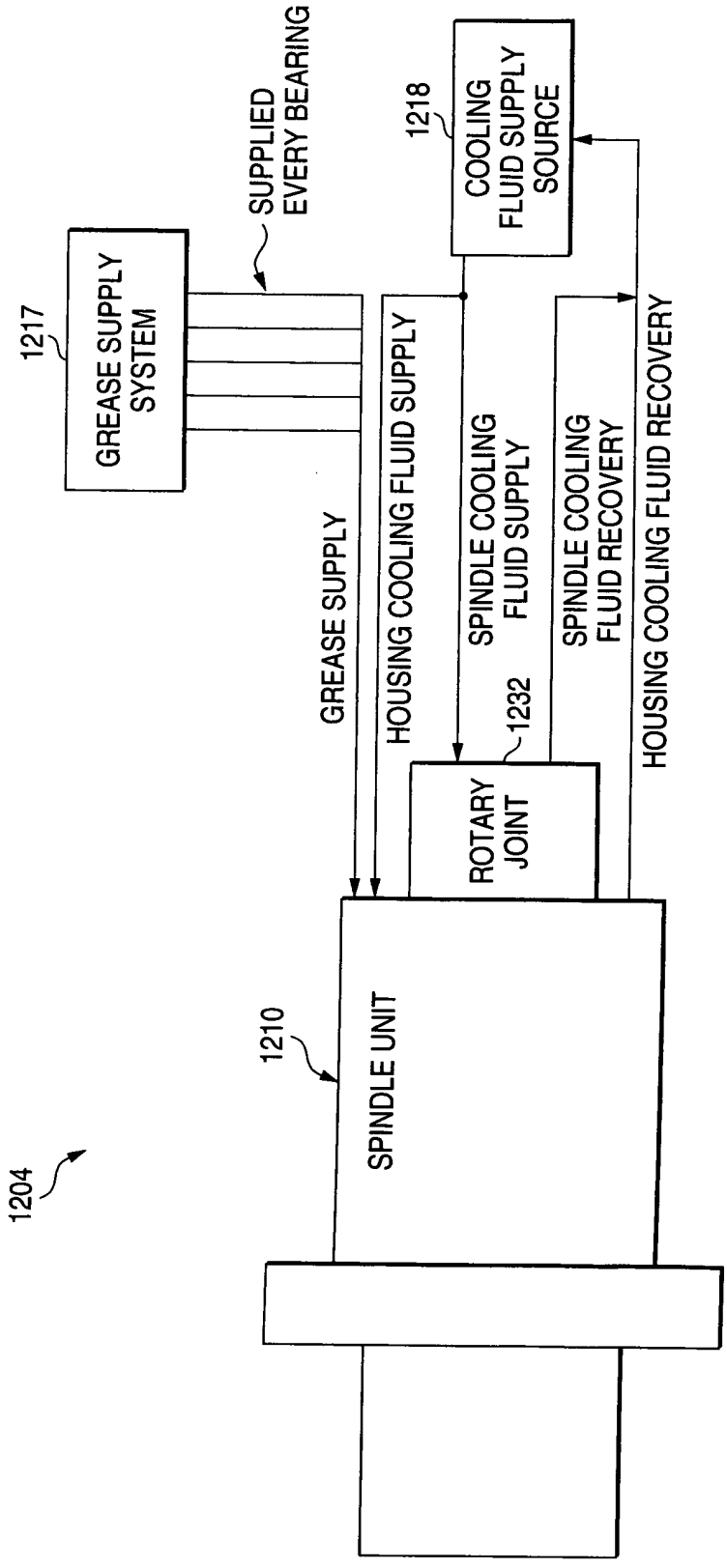


FIG. 82

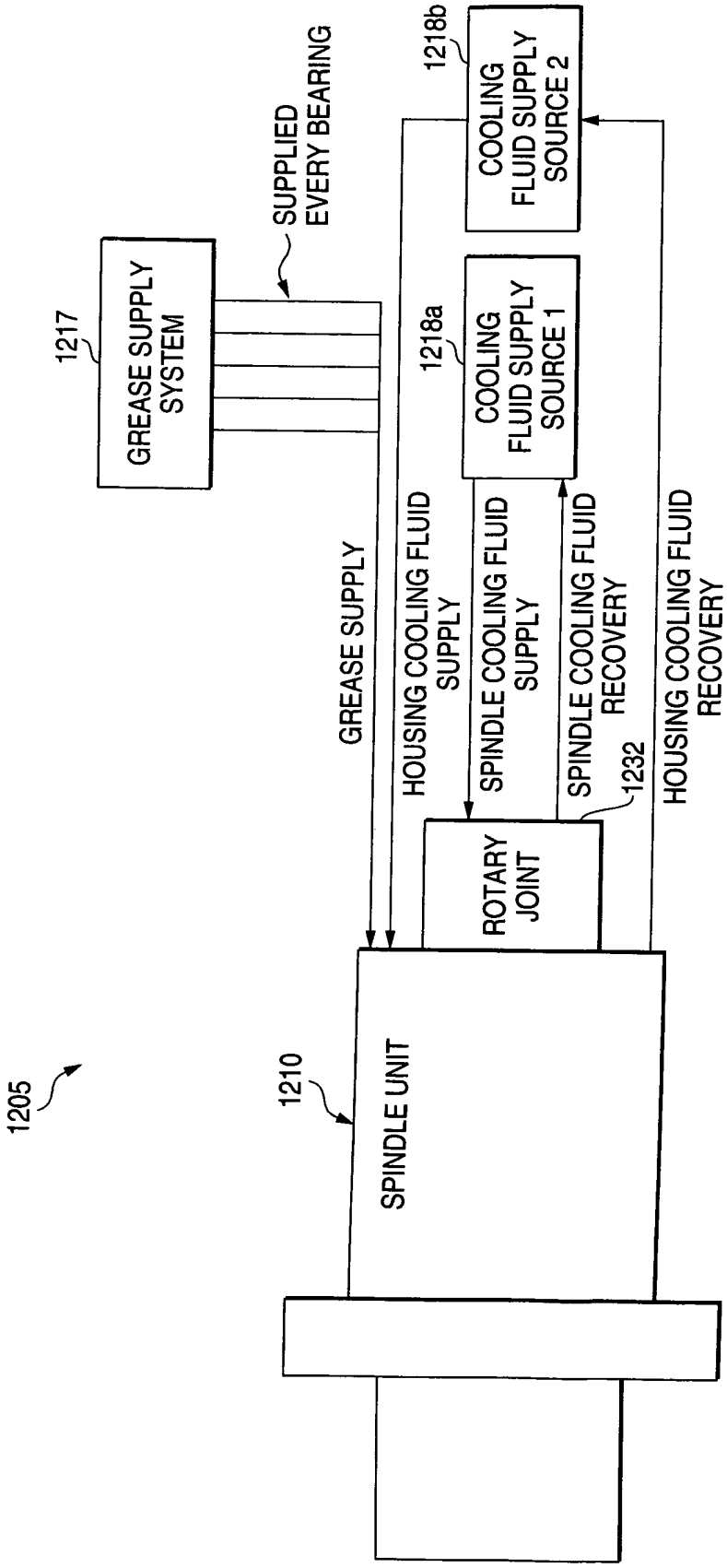

1205
1210
SPINDLE UNIT
ROTARY JOINT
1232
GREASE SUPPLY
HOUSING COOLING FLUID SUPPLY
SPINDLE COOLING FLUID SUPPLY
SPINDLE COOLING FLUID RECOVERY
HOUSING COOLING FLUID RECOVERY
1217
GREASE SUPPLY SYSTEM
SUPPLIED EVERY BEARING
1218a
COOLING FLUID SUPPLY SOURCE 1
1218b
COOLING FLUID SUPPLY SOURCE 2

FIG. 83

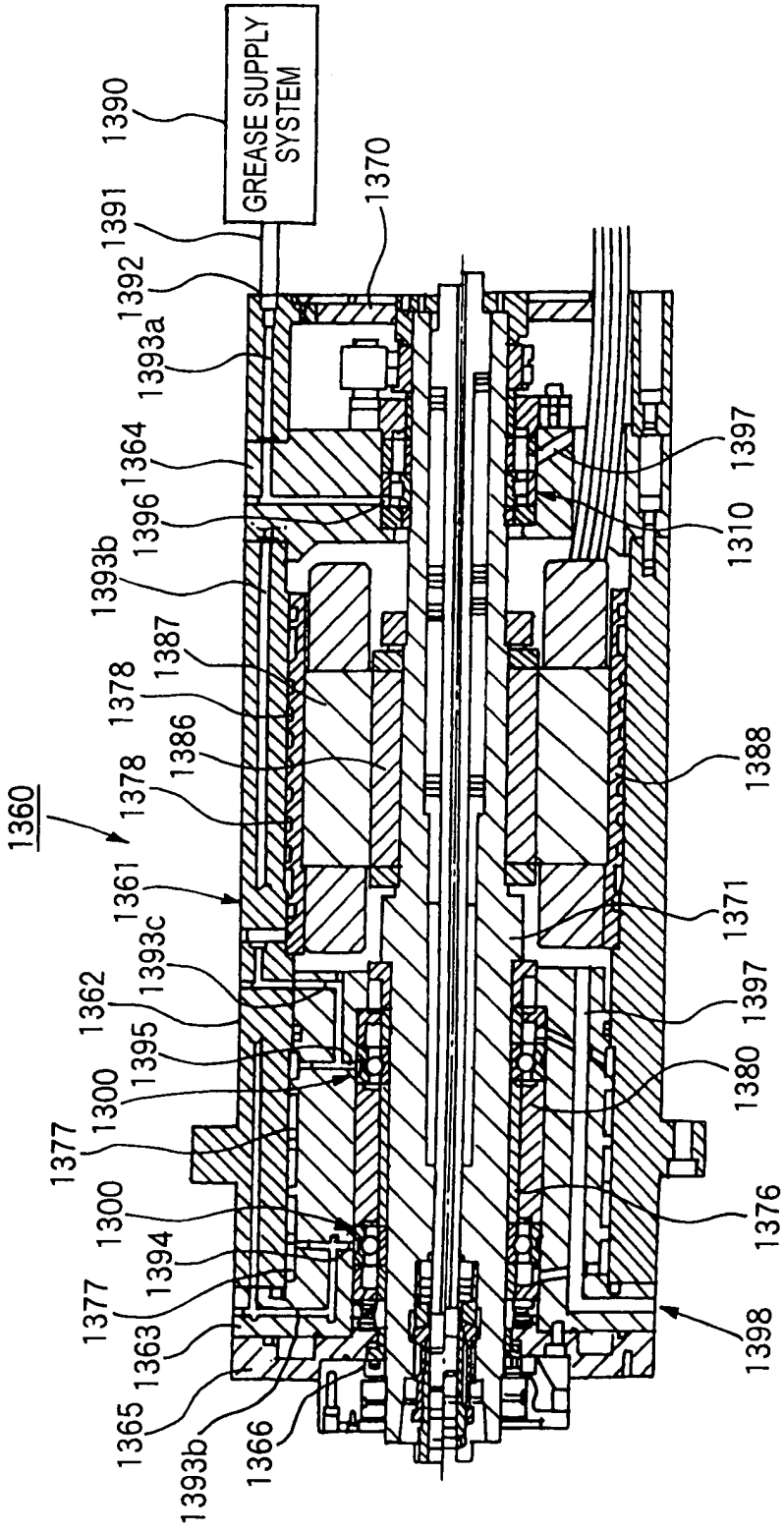

GREASE SUPPLY SYSTEM
1390
1391
1392
1393a
1364
1396
1393b
1387
1378
1386
1378
1360
1361
1393c
1362
1395
1300
1377
1300
1394
1377
1363
1365
1393b
1366
1370
1397
1310
1388
1371
1397
1380
1376
1398

FIG. 84

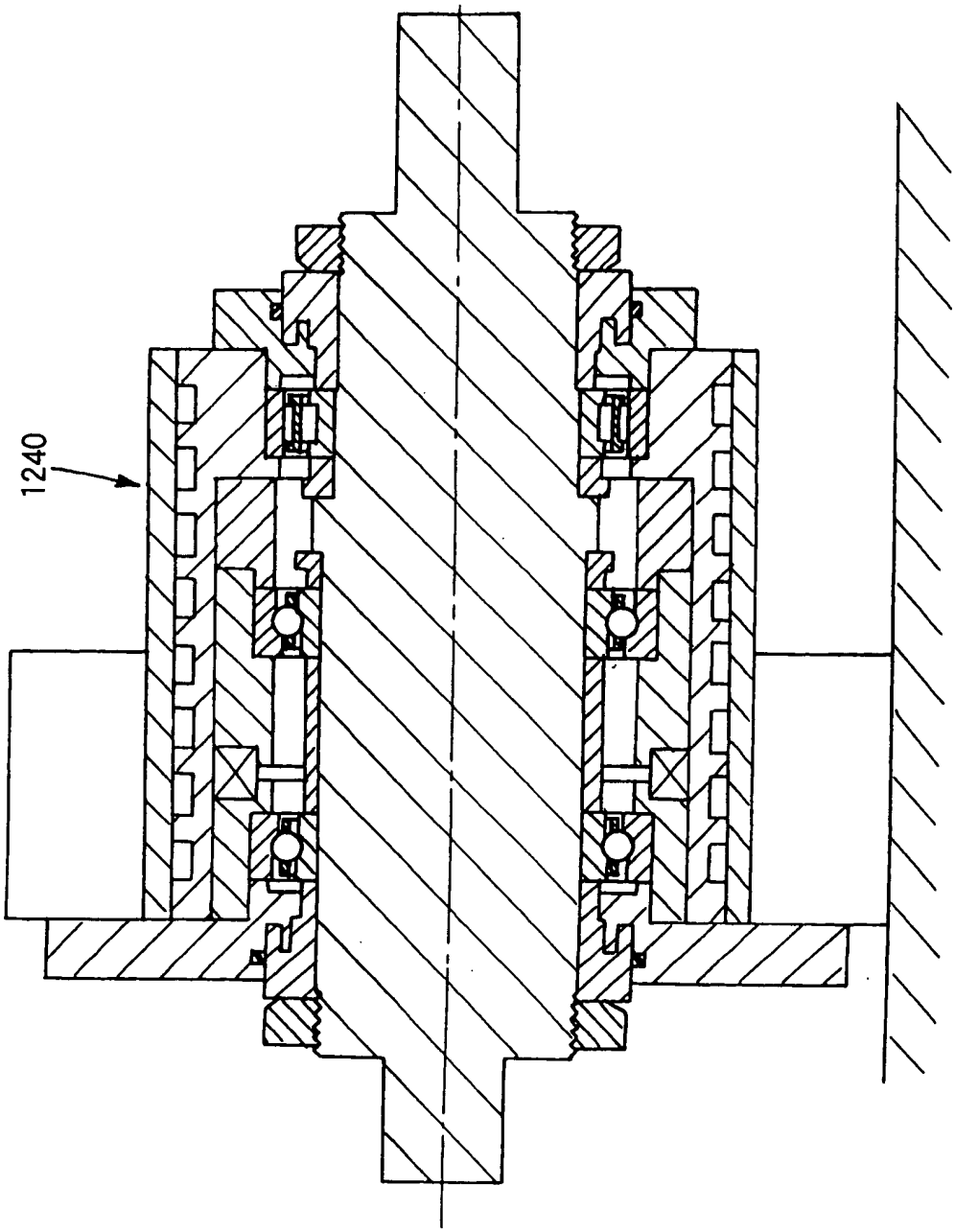


FIG. 85

TEST NO.	1	2	3
CONSTANT PRELOAD (N)	1870	1870	1870
AMOUNT INITIALLY SEALED OF GREASE (%)	1	5	15
AMOUNT INITIALLY SEALED OF GREASE (cc)	0.15	0.75	2.25
COOLING (COOLING OIL TEMPERATURE)	APPLIED (25°C)	APPLIED (25°C)	APPLIED (25°C)
BEARING TEMPERATURE (°C)	42	42	42
ENDURANCE TIME (hr)	28.5	118.5	260

FIG. 86

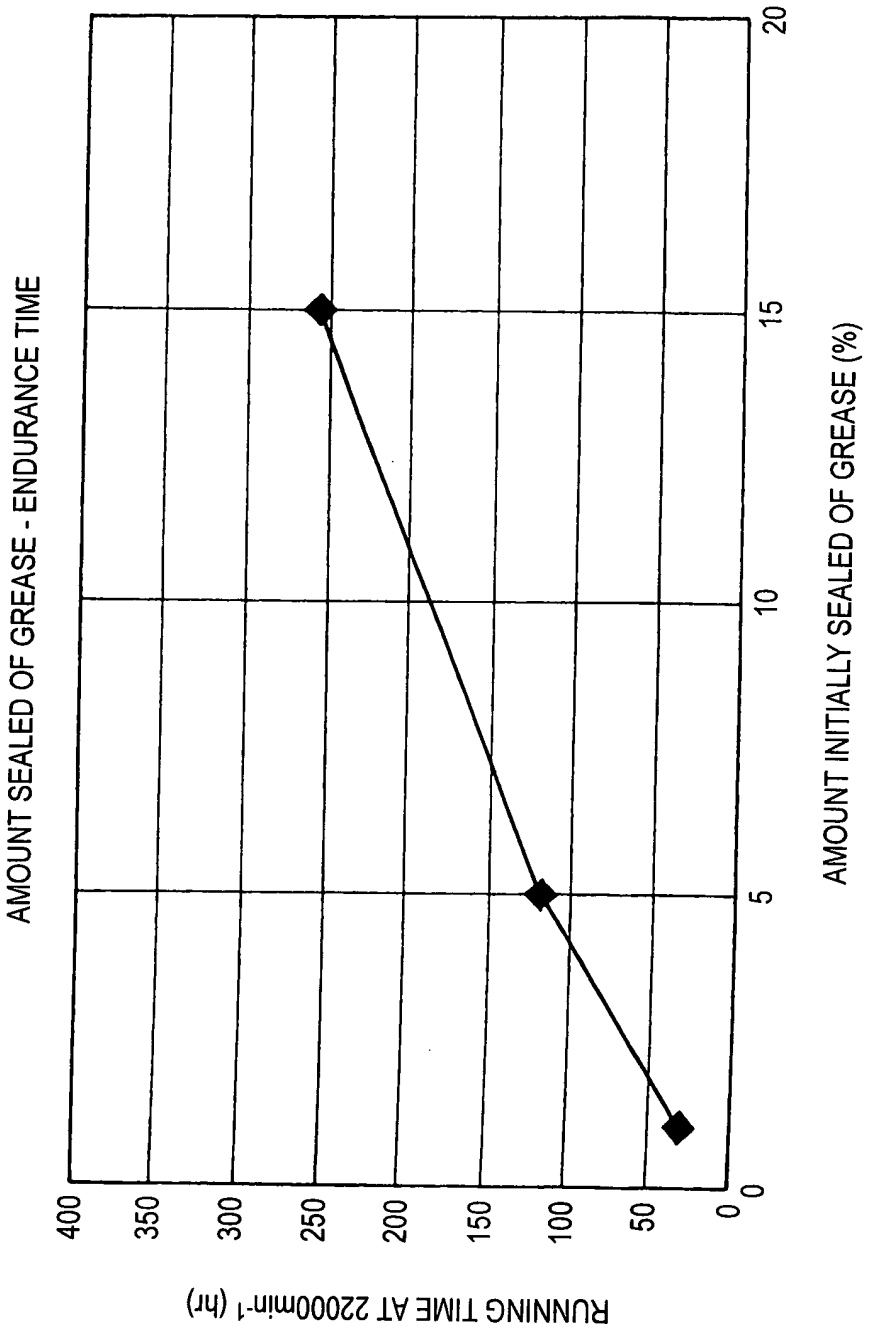

AMOUNT SEALED OF GREASE - ENDURANCE TIME
AMOUNT INITIALLY SEALED OF GREASE (%)
RUNNING TIME AT 2000min-1 (hr)
400
350
300
250
200
150
100
50
0
0
5
10
15
20

FIG. 87

TEST NO.	1	4	5
CONSTANT PRELOAD (N)	1870	1870	1870
AMOUNT INITIALLY SEALED OF GREASE (%)	1	1	1
AMOUNT INITIALLY SEALED OF GREASE (cc)	0.15	0.15	0.15
COOLING (COOLING OIL TEMPERATURE)	APPLIED (25°C)	APPLIED (20°C)	NOT APPLIED
BEARING TEMPERATURE (°C)	42	30	62
ENDURANCE TIME (hr)	28.5	56	8

FIG. 88

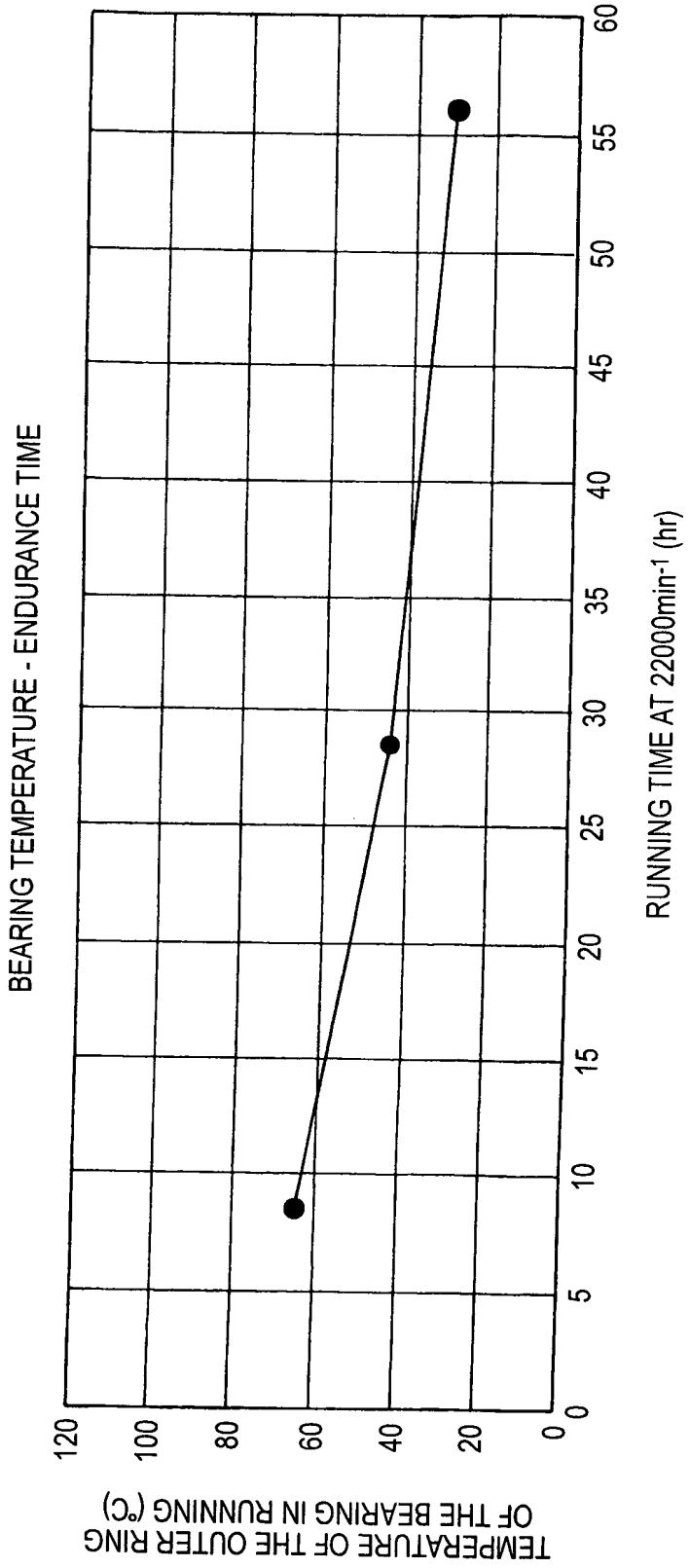

BEARING TEMPERATURE - ENDURANCE TIME
TEMPERATURE OF THE OUTER RING OF THE BEARING IN RUNNING (°C)
120
100
80
60
40
20
0
RUNNING TIME AT 22000min-1 (hr)
0
5
10
15
20
25
30
35
40
45
50
55
60

FIG. 89

TEST NO.	2	6	7	8
CONSTANT PRELOAD (N)	1870	2200	2600	3000
AMOUNT INITIALLY SEALED OF GREASE (%)	5	←	←	←
AMOUNT INITIALLY SEALED OF GREASE (cc)	0.75	←	←	←
COOLING (COOLING OIL TEMPERATURE)	APPLIED (25°C)	←	←	←
BEARING TEMPERATURE (°C)	42	←	←	←
ENDURANCE TIME (hr)	118.5	56	45	29

FIG. 90

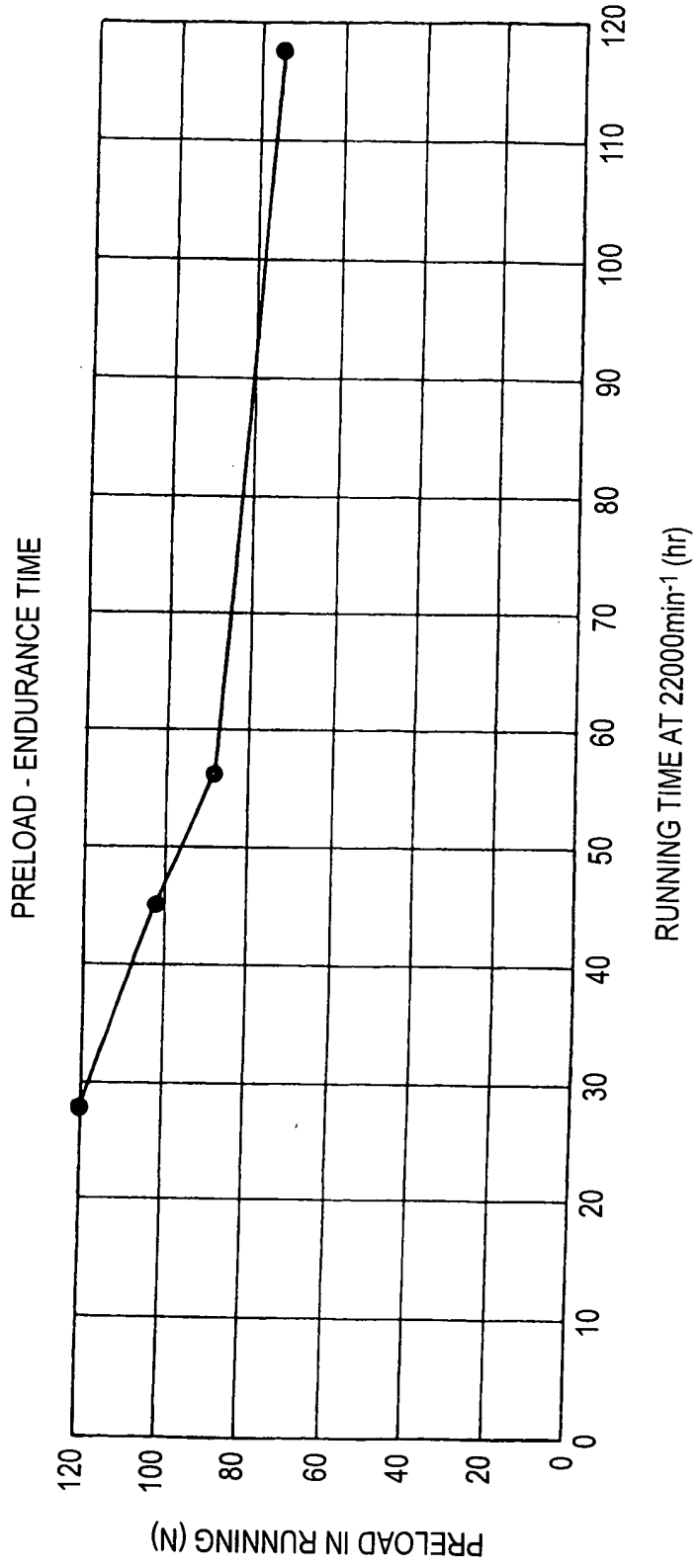

PRELOAD - ENDURANCE TIME
RUNNING TIME AT 22000min-1 (hr)
0
10
20
30
40
50
60
70
80
90
100
110
120
PRELOAD IN RUNNING (N)
120
100
80
60
40
20
0

FIG. 91

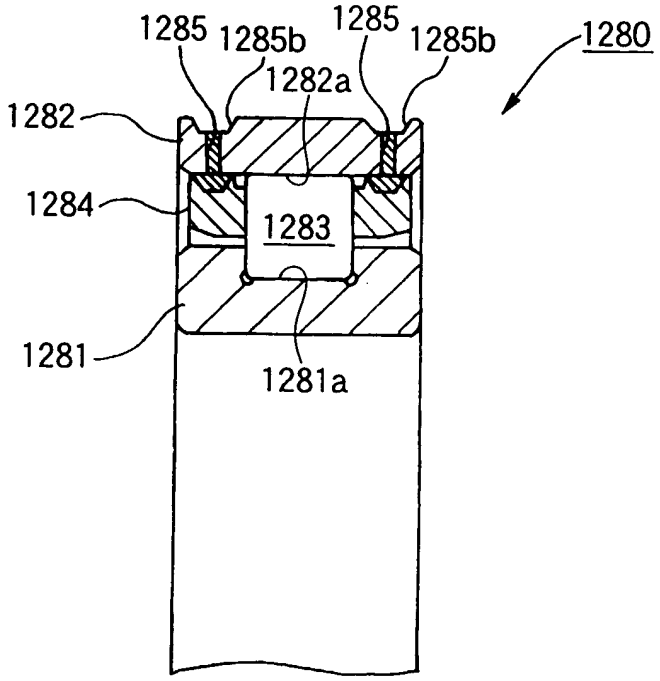


FIG. 92 (c)

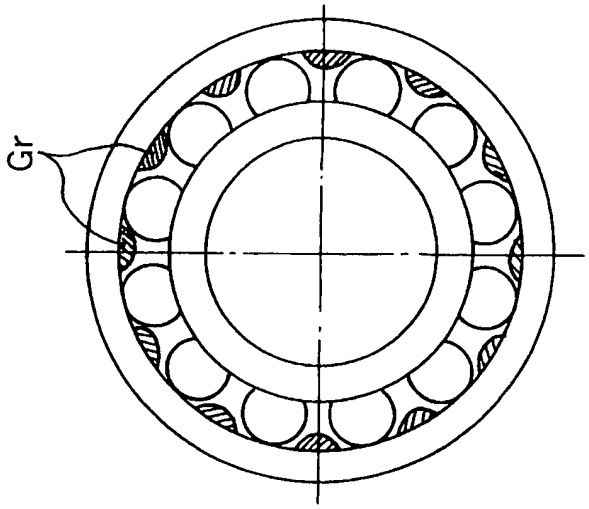


FIG. 92 (b)

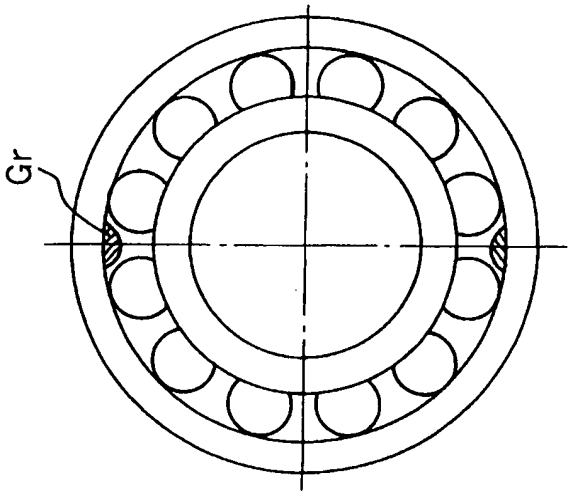


FIG. 92 (a)

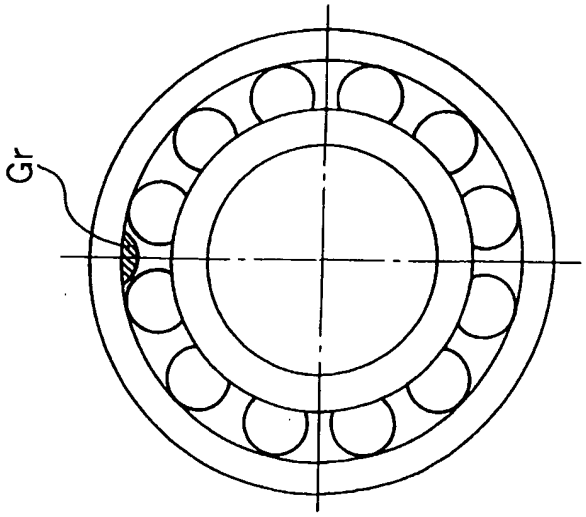


FIG. 93

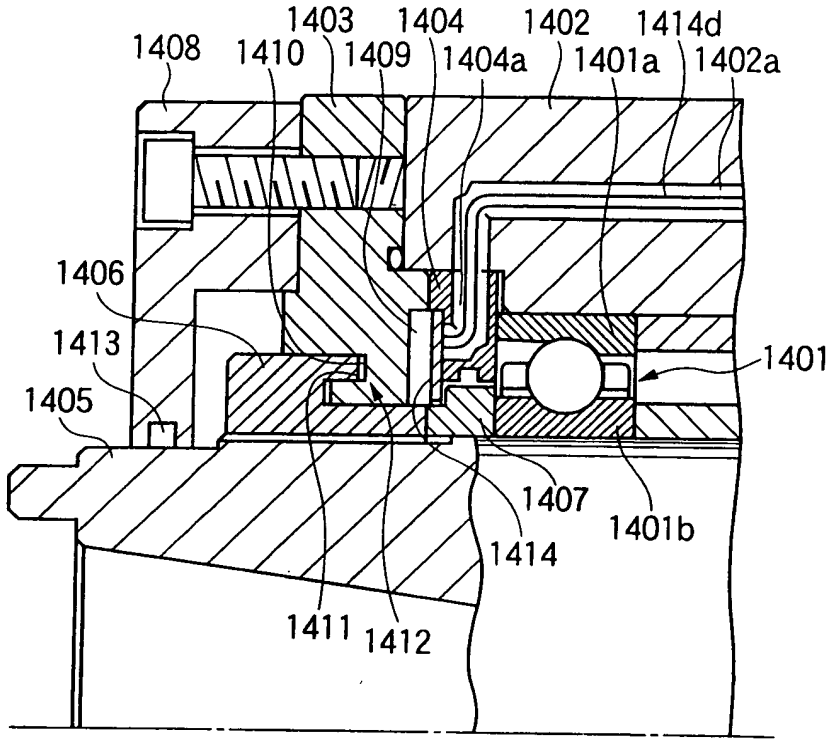


FIG. 94

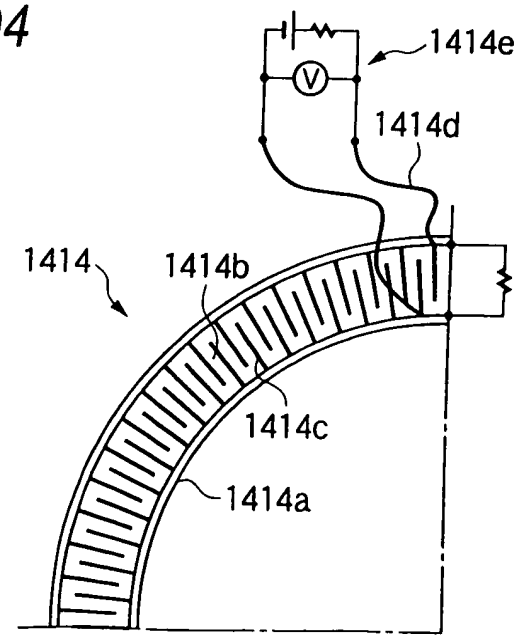


FIG. 95

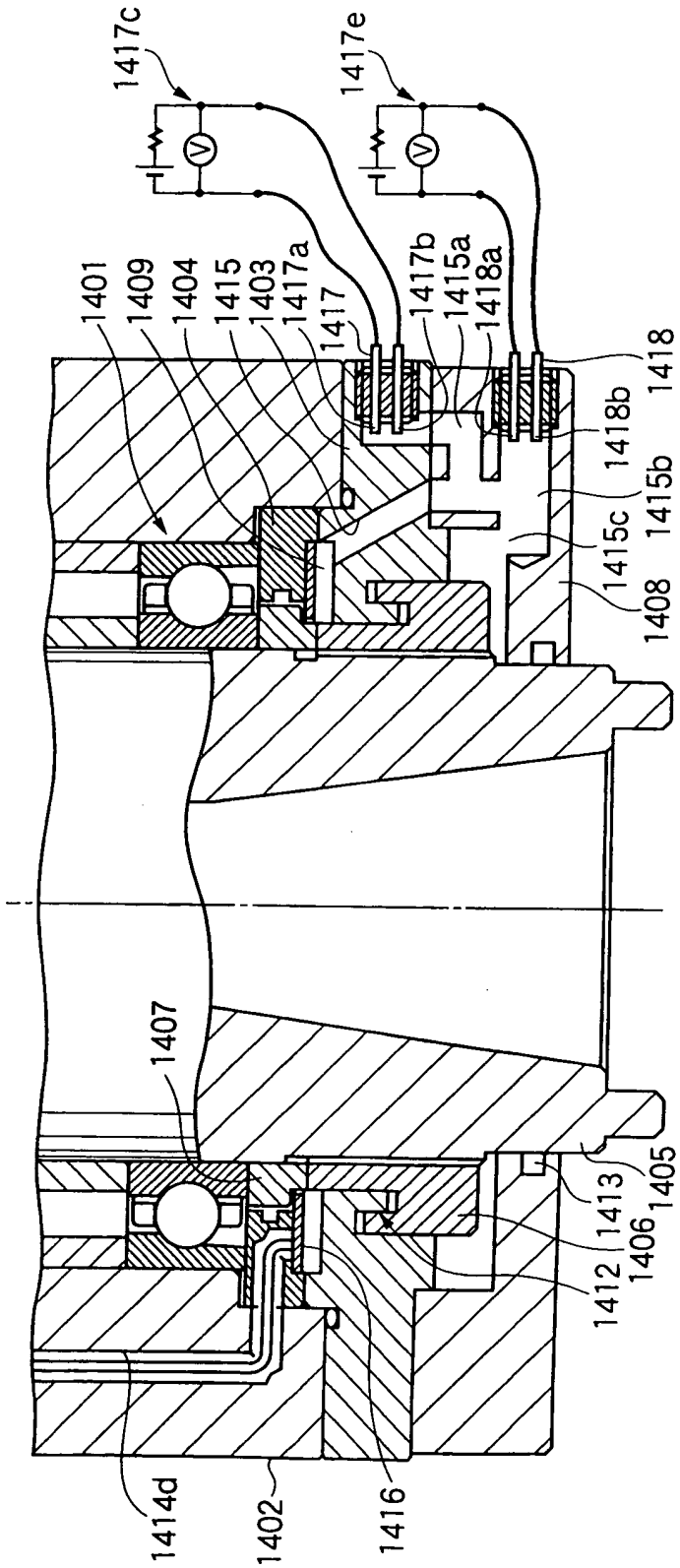

1417c
1417e
1401
1409
1404
1415
1403
1417a
1417
1417b
1415a
1418a
1418
1418b
1415b
1415c
1408
1407
1405
1413
1406
1412
1414d
1402
1416

FIG. 96

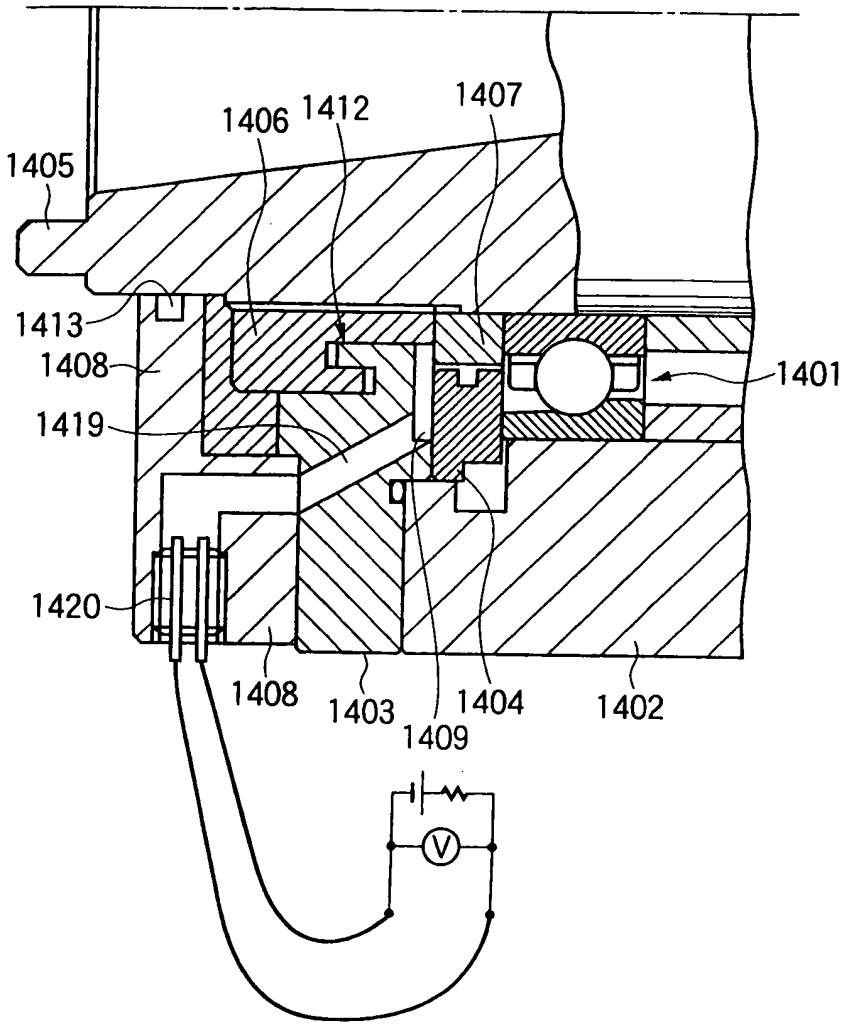

1405
1406
1412
1407
1413
1408
1401
1419
1420
1408
1403
1404
1402
1409
V

FIG. 97

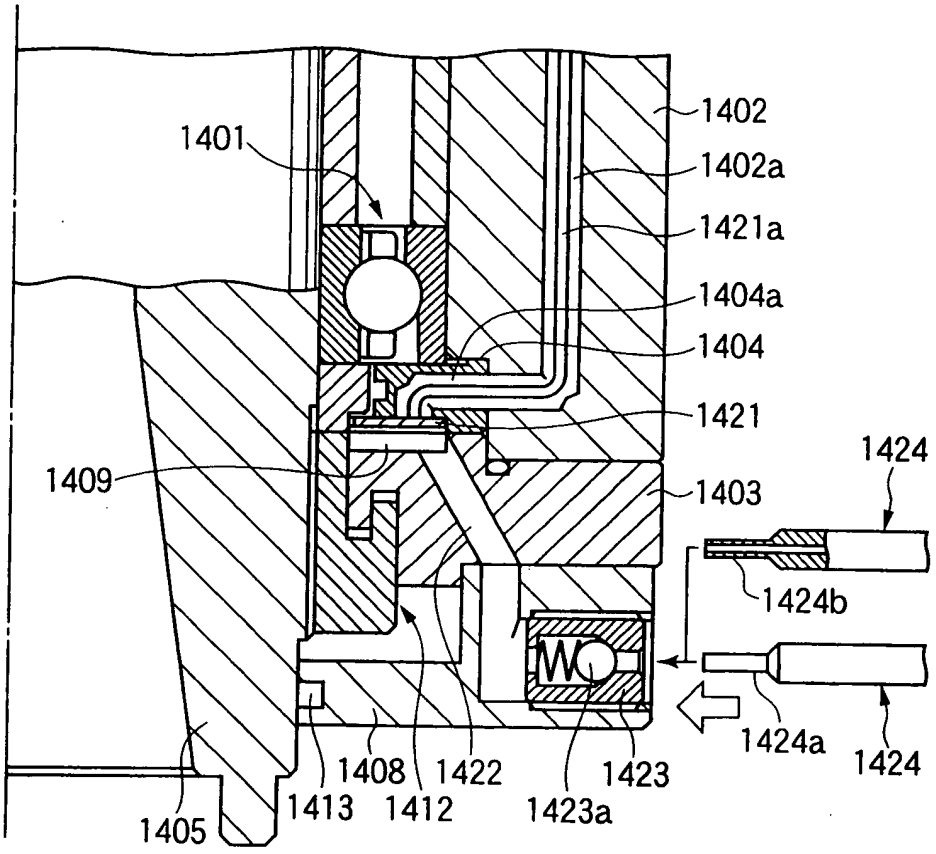

1401
1402
1402a
1421a
1404a
1404
1421
1424
1409
1403
1424b
1424a
1424
1408
1422
1423
1413
1412
1423a
1405

FIG. 98

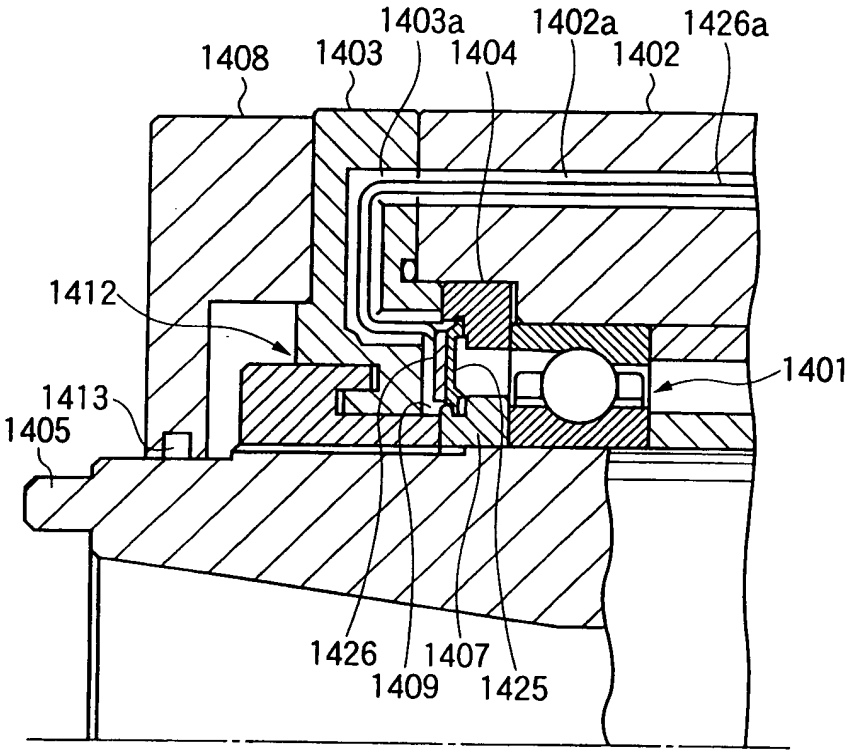

1403a
1402a
1426a
1408
1403
1404
1402
1412
1401
1413
1405
1426
1407
1409
1425

FIG. 99

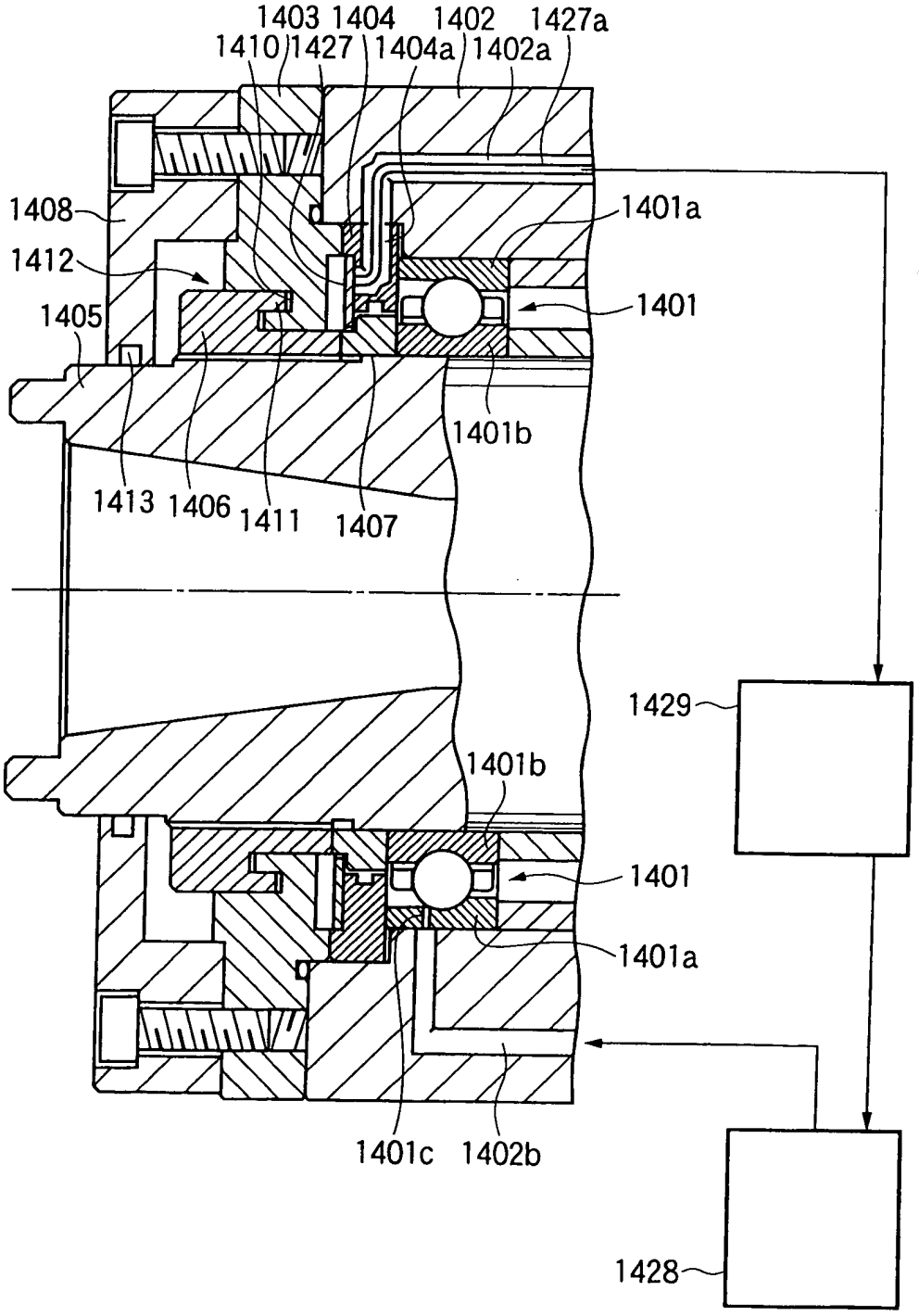


FIG. 100

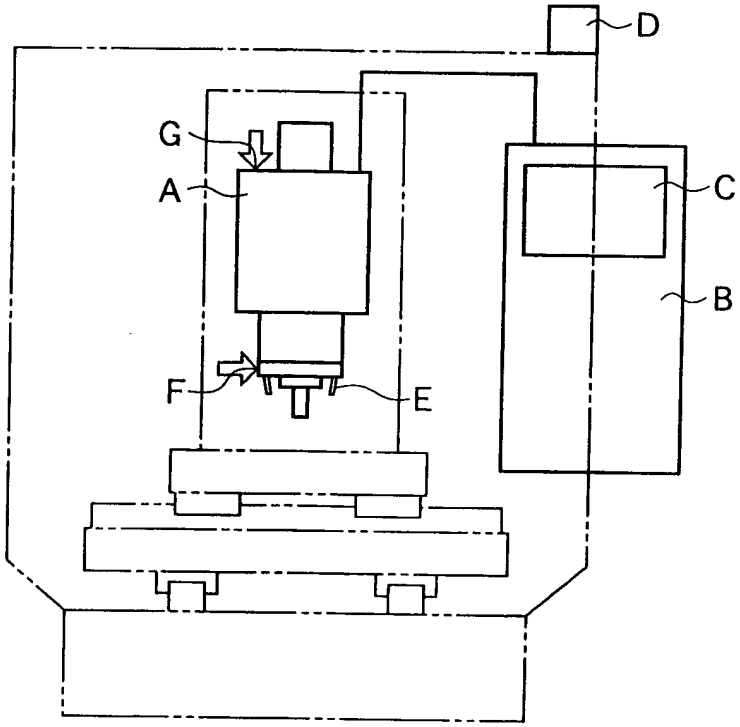


FIG. 101

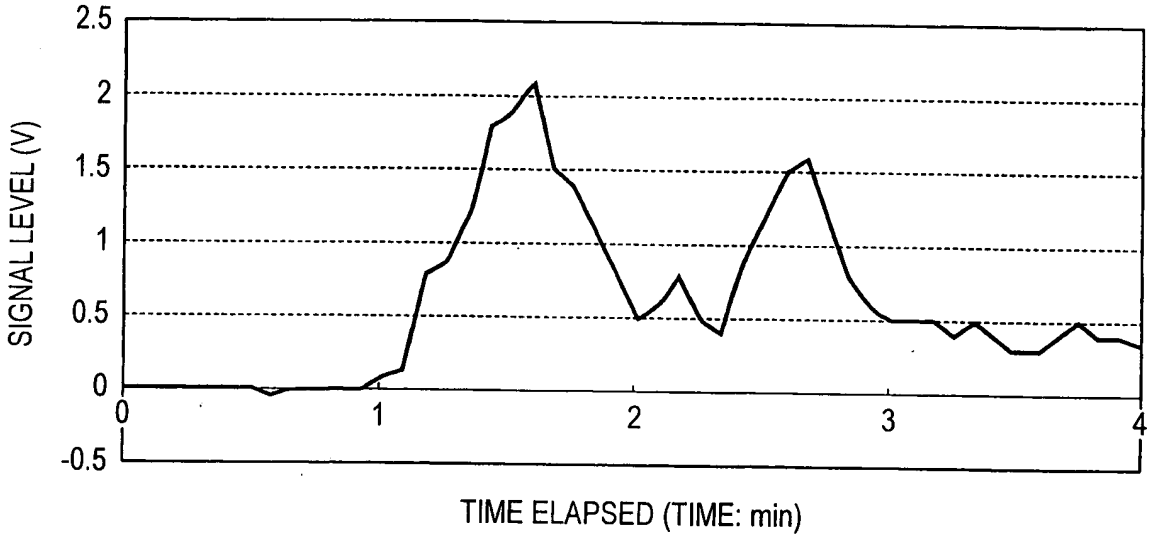


FIG. 102

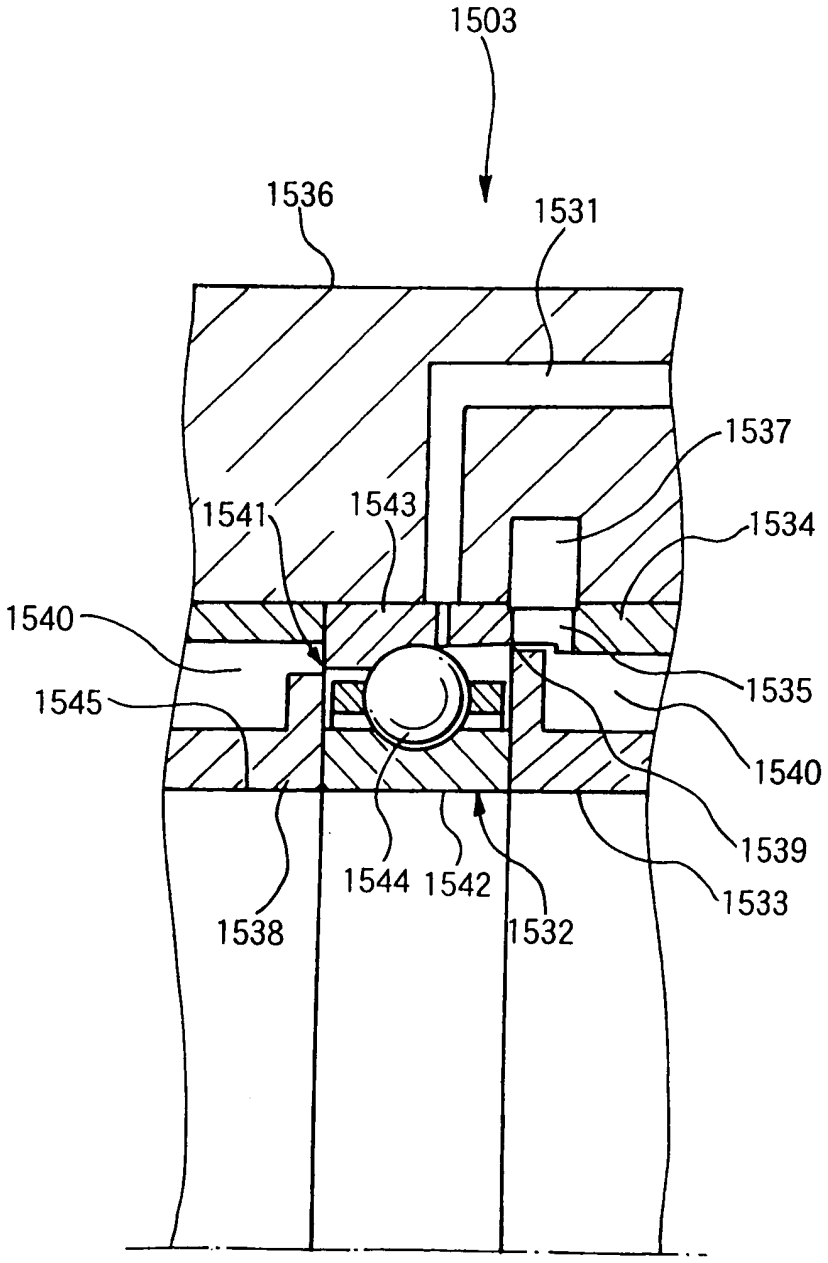

1503
1536
1531
1537
1541
1543
1534
1540
1545
1535
1540
1539
1533
1544
1542
1538
1532

FIG. 103 (a)

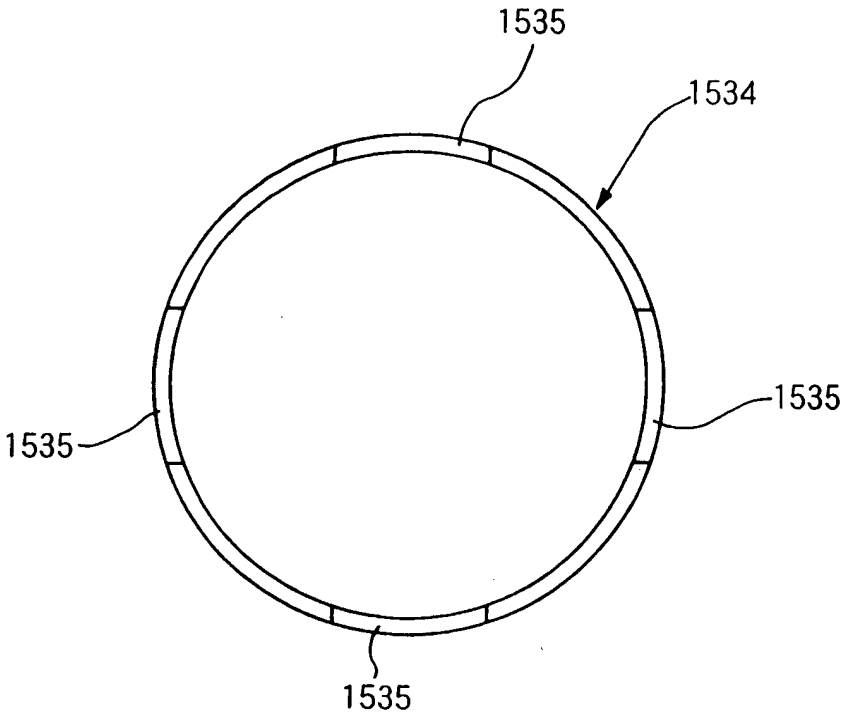


FIG. 103 (b)

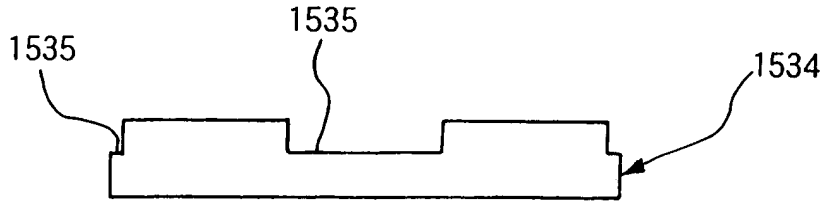


FIG. 104

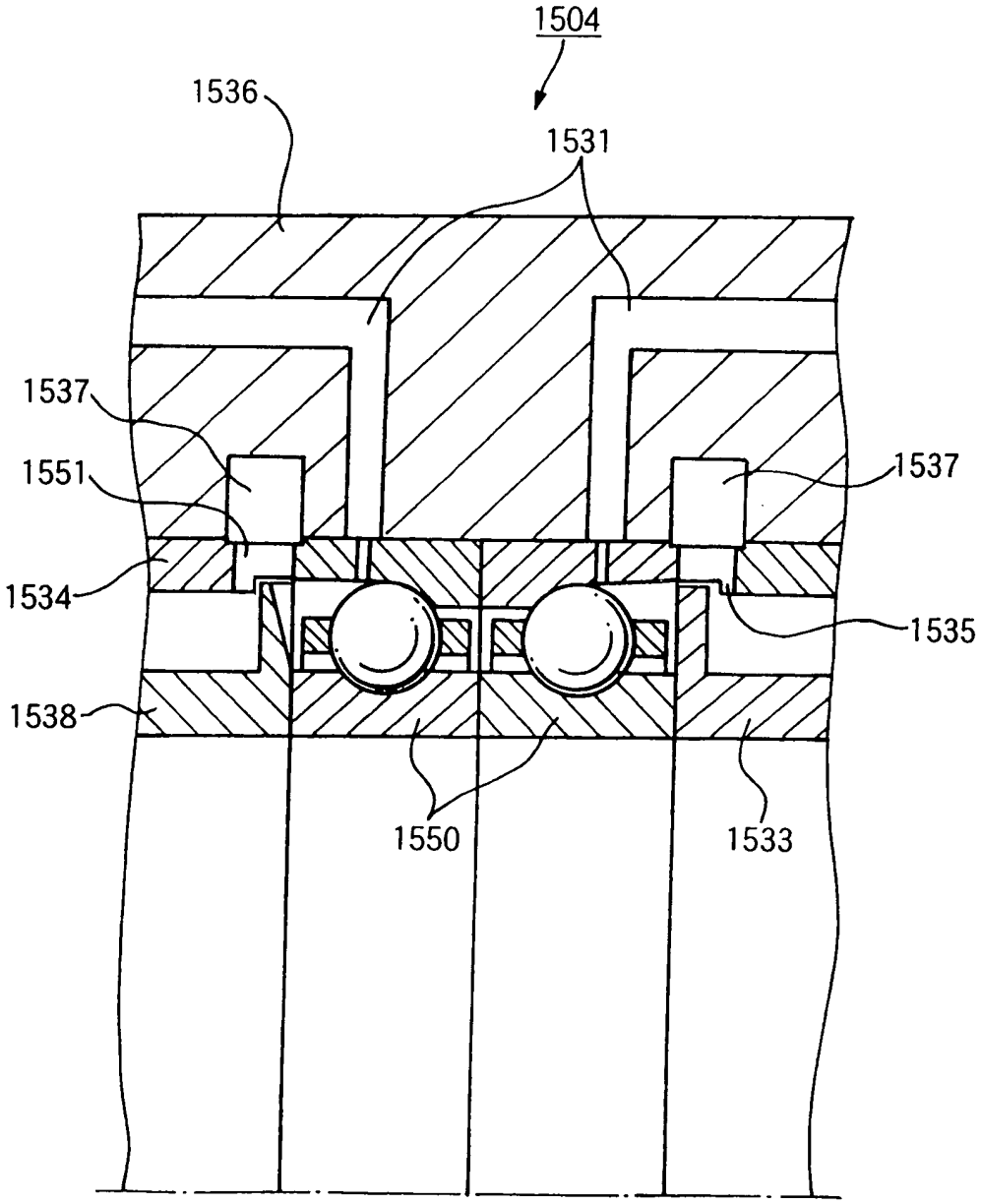


FIG. 105 (a)

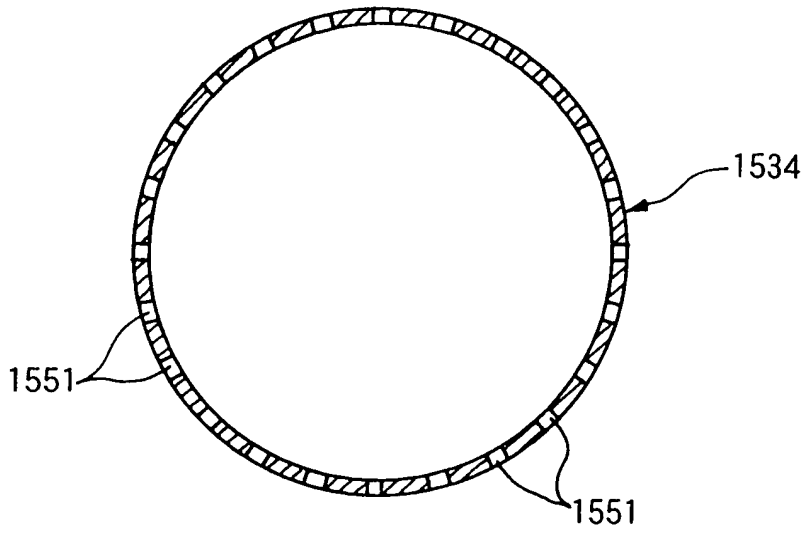


FIG. 105 (b)

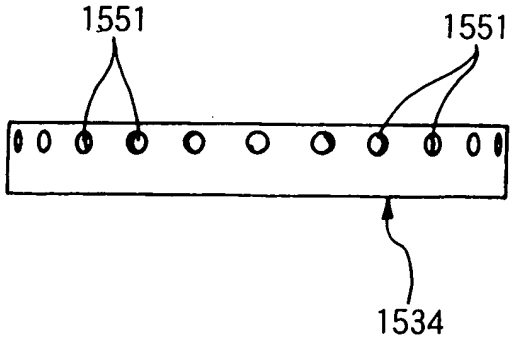


FIG. 106

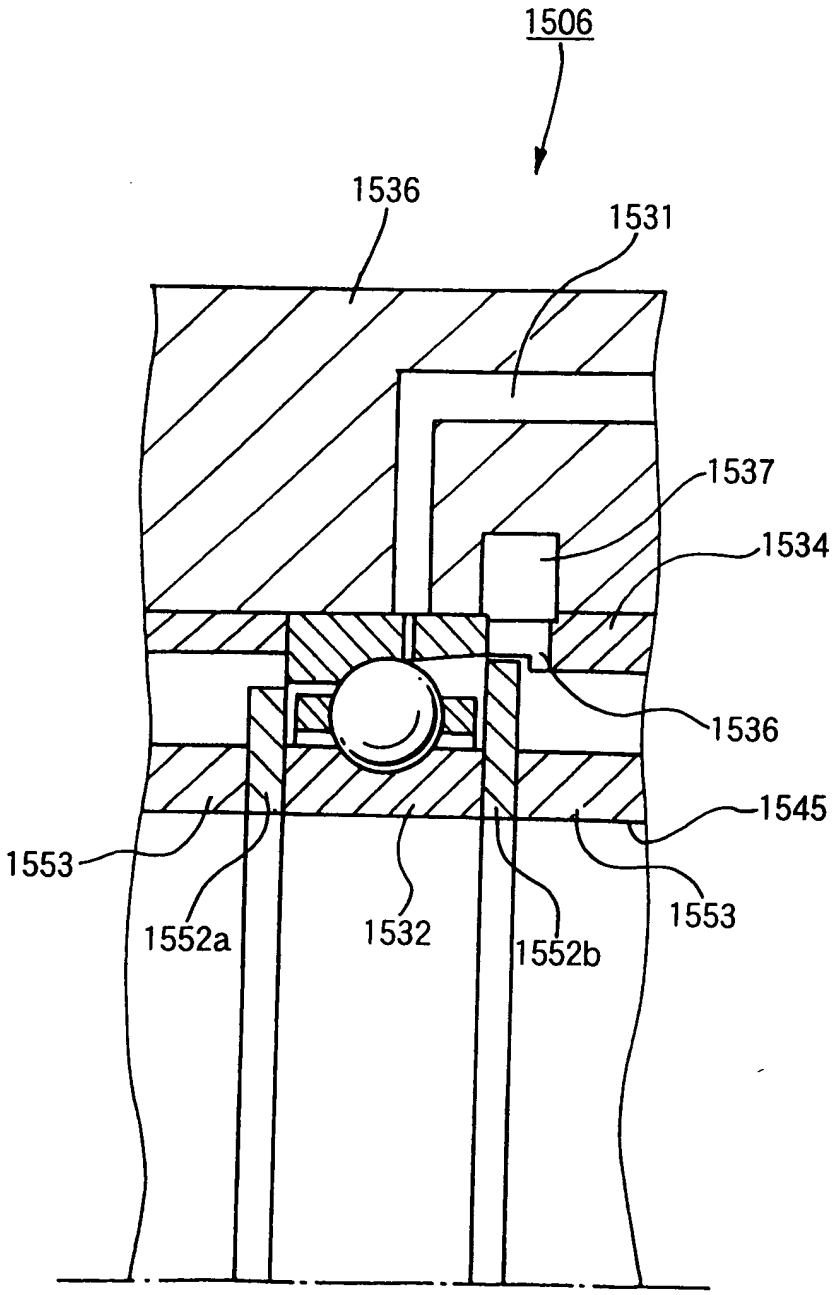

1506
1536
1531
1537
1534
1536
1545
1553
1553
1552a
1532
1552b

FIG. 107

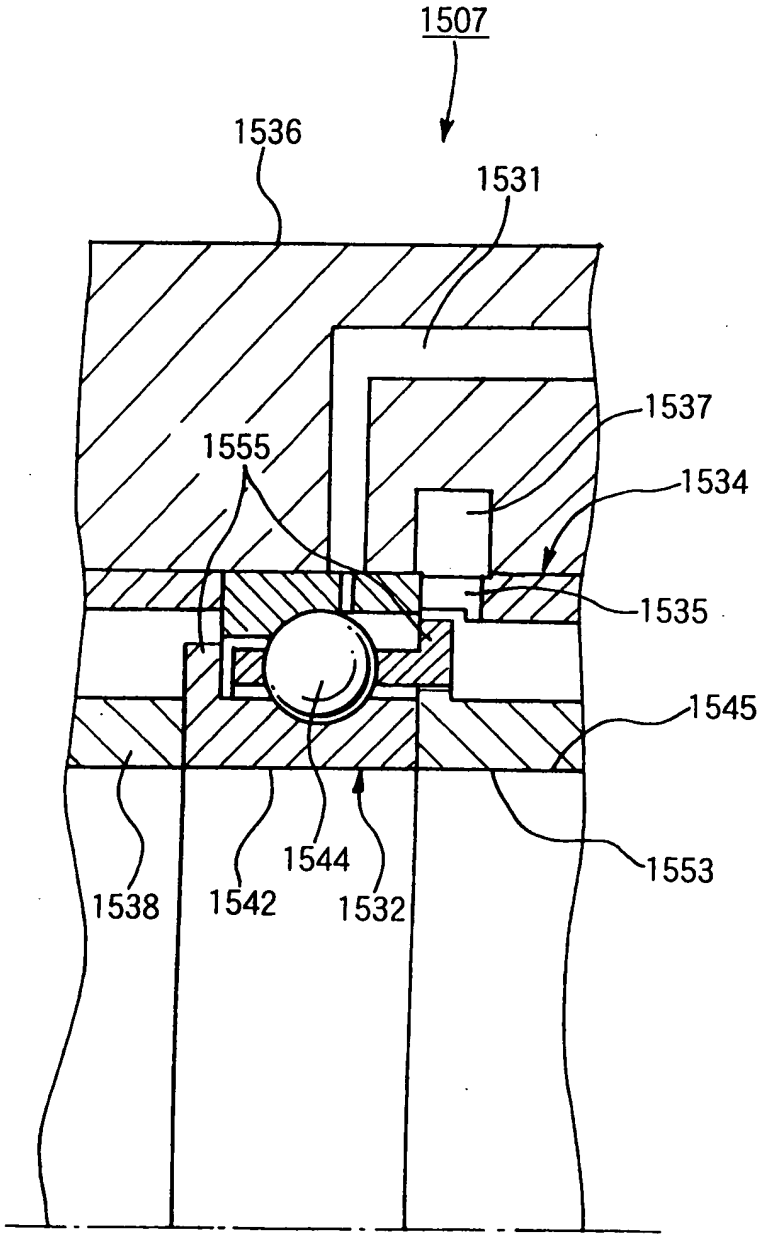

1507
1536
1531
1537
1555
1534
1535
1545
1553
1544
1538
1542
1532

FIG. 108

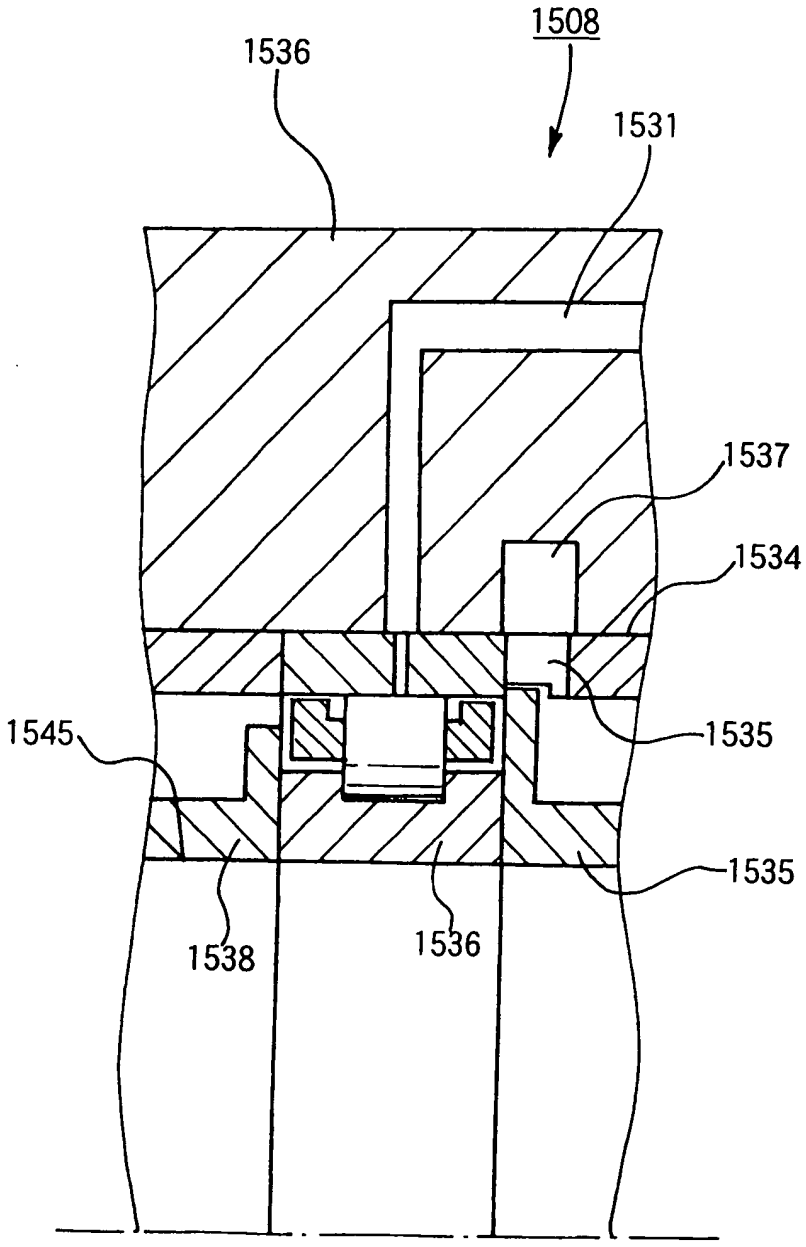


FIG. 109

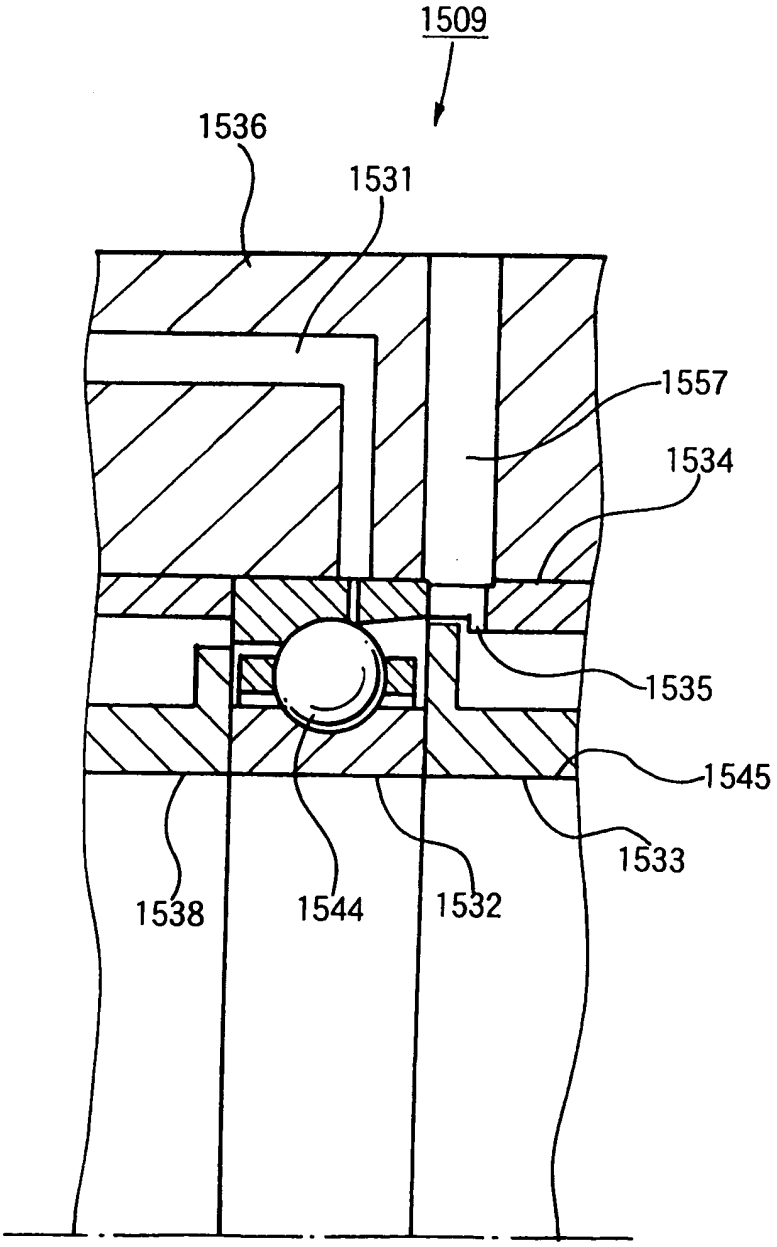


FIG. 110

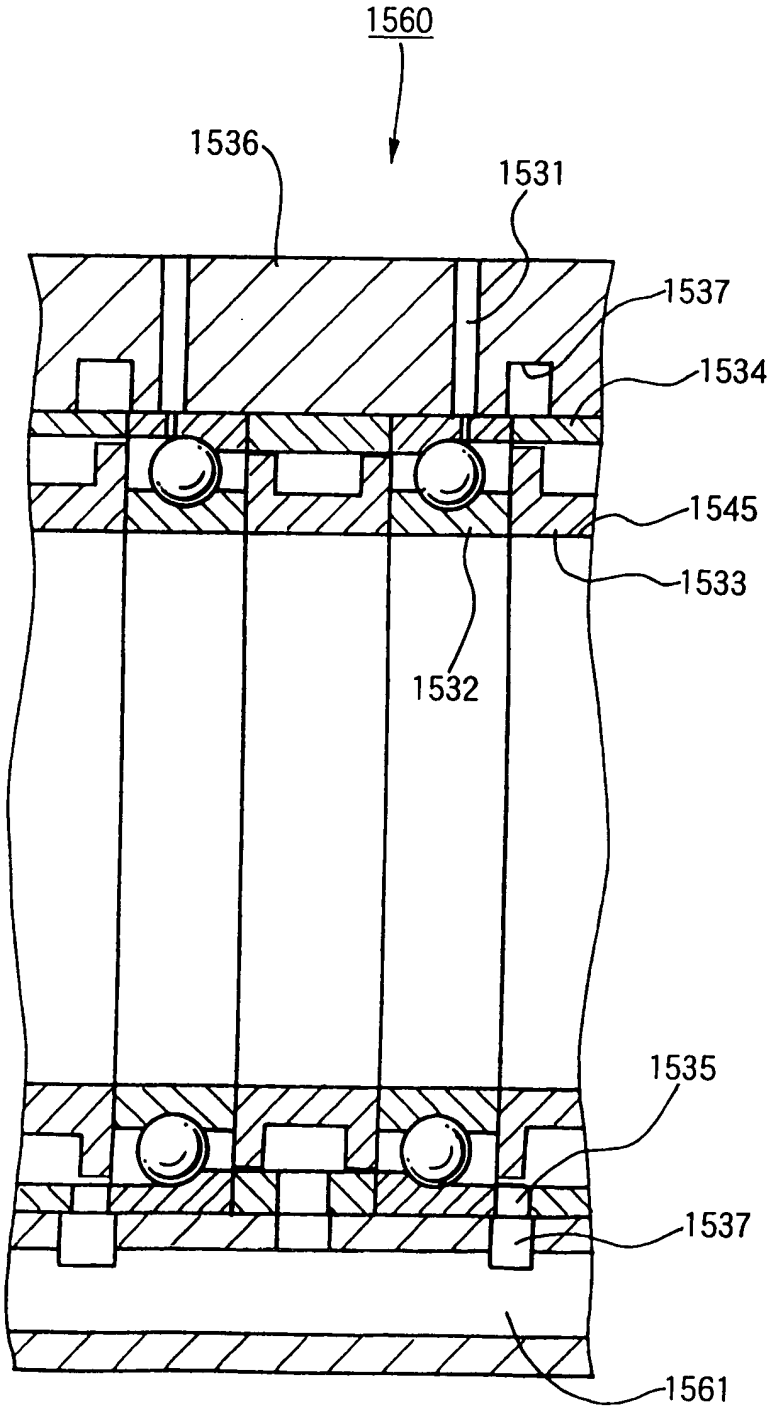


FIG. 111

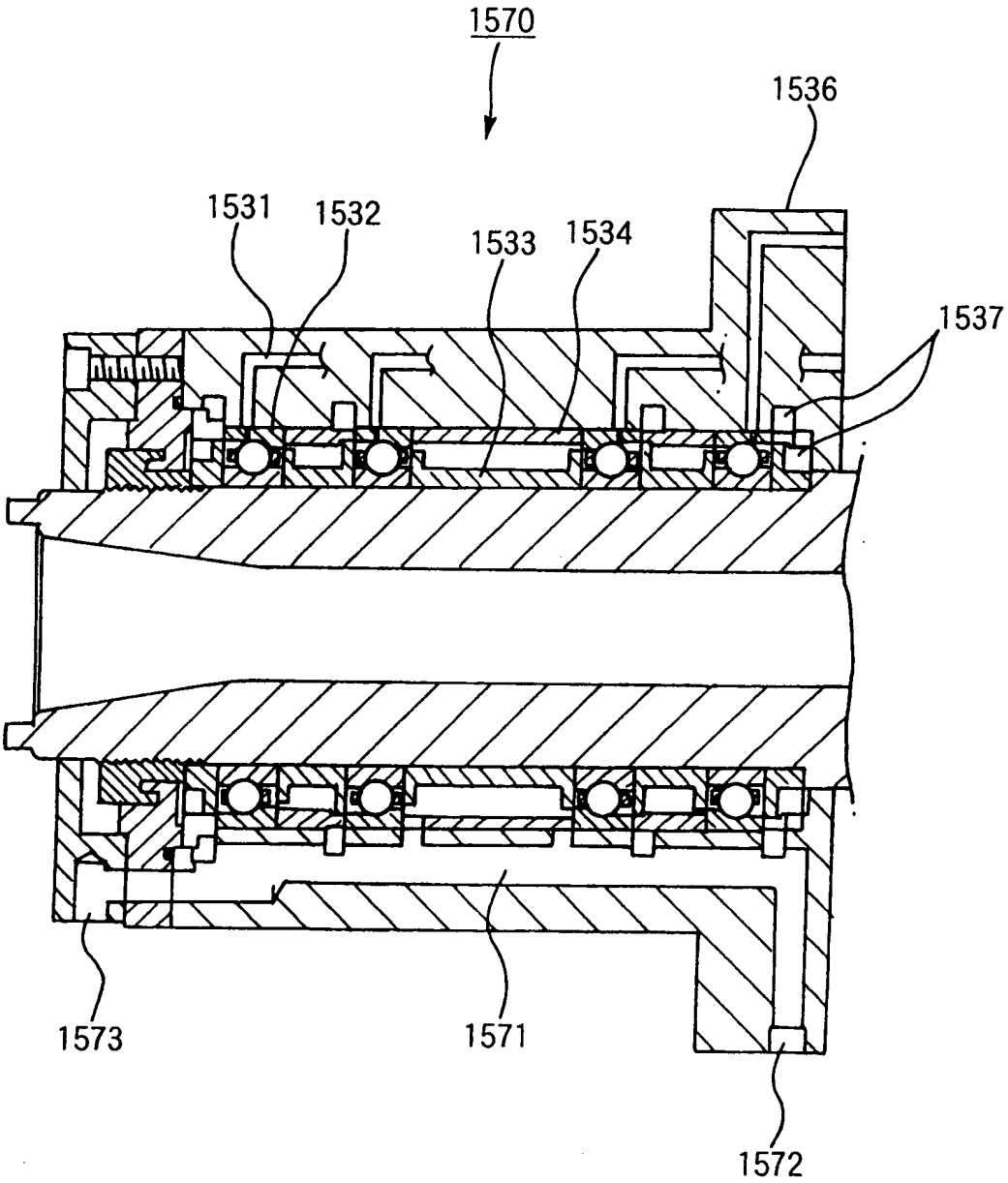


FIG. 112 (a)

	PRIOR ART	PRESENT INVENTION
CONTINUOUS OPERATION TIME	ABNORMAL TEMPERATURE RISE IN 45 HOURS	NO ABNORMAL TEMPERATURE RISE AFTER 100 HOURS
RESIDUAL AMOUNT OF THE GREASE IN THE BEARING	REMAINED BY 70% OF THE BEARING SPACE VOLUME	REMAINED BY 30 TO 40% OF THE BEARING SPACE VOLUME

FIG. 112 (b)

TEST CONDITIONS

INNER DIAMETER OF THE BEARING	65mm
THE NUMBER OF ROTATION OF THE SPINDLE	20000rpm
TEST TIME	100 HOURS
LUBRICANT	LUBRICANT: GREASE INITIALLY SEALED AMOUNT: 15% OF THE BEARING SPACE VOLUME
	SUPPLY AMOUNT: 0.02cc/7.5min (PER BEARING)

FIG. 113

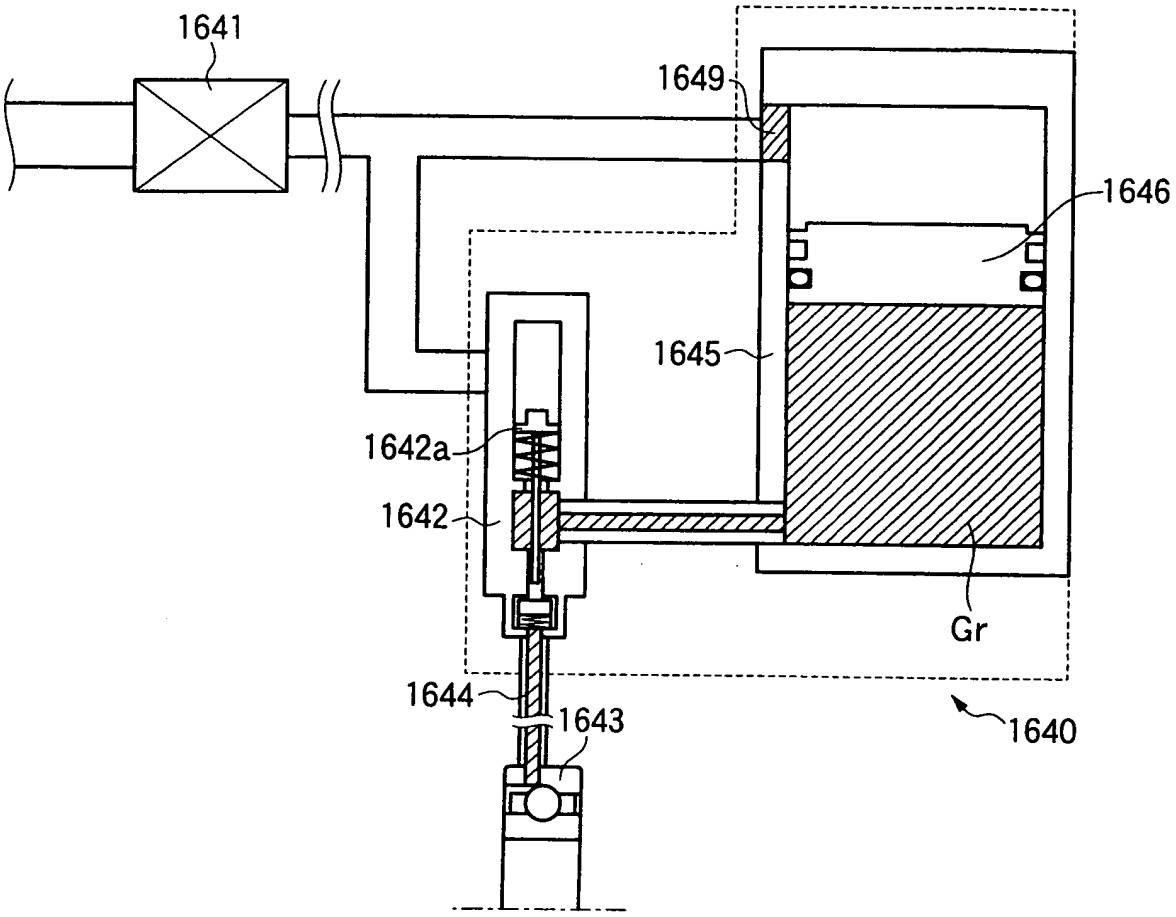


FIG. 114

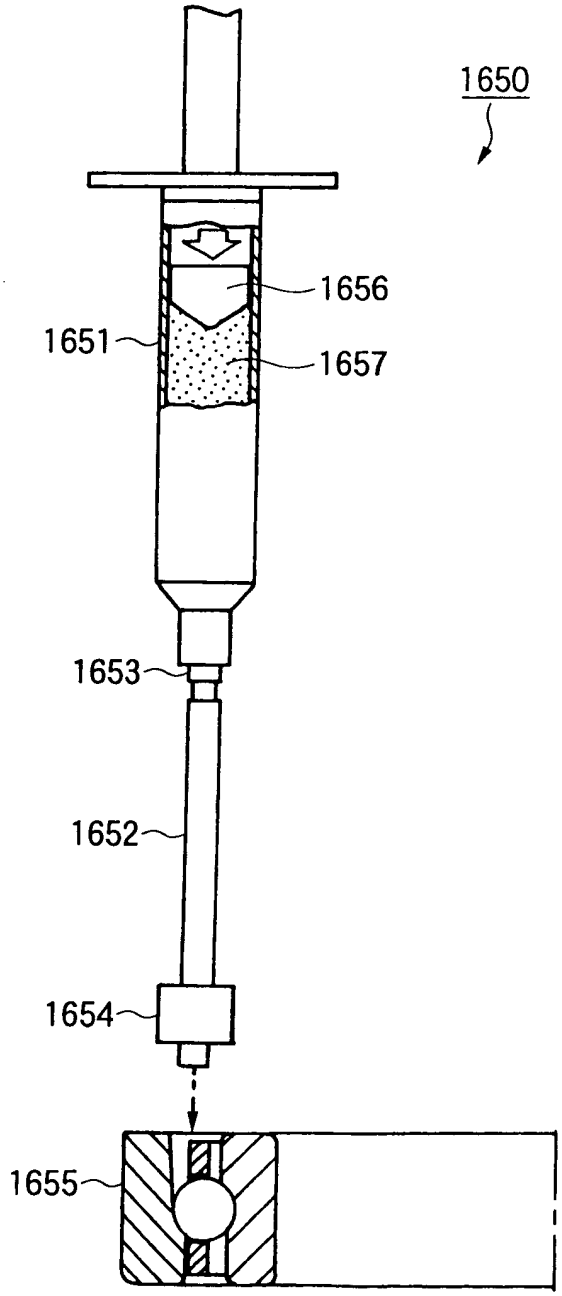


FIG. 115

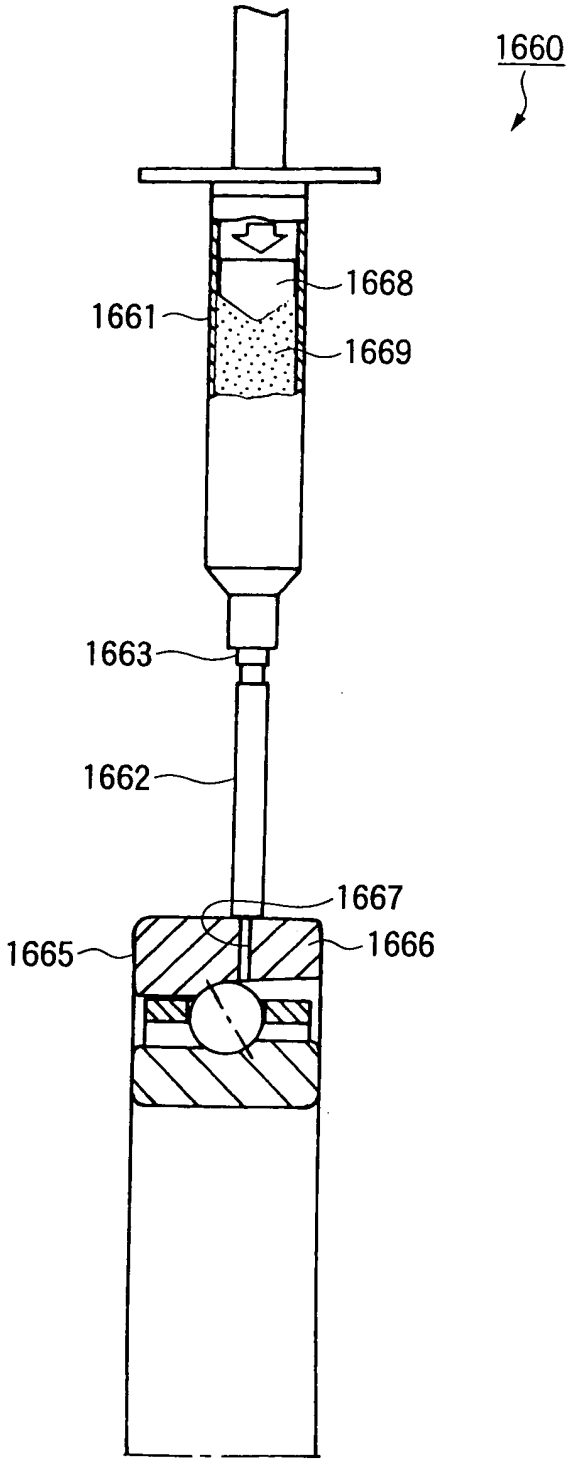


FIG. 116

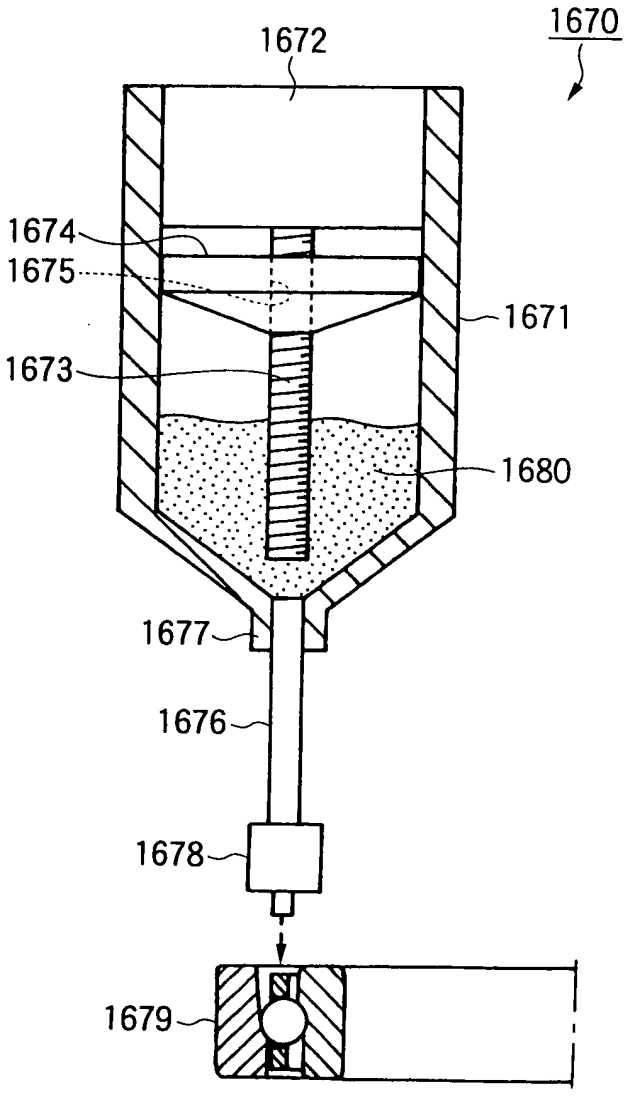


FIG. 117 (a)

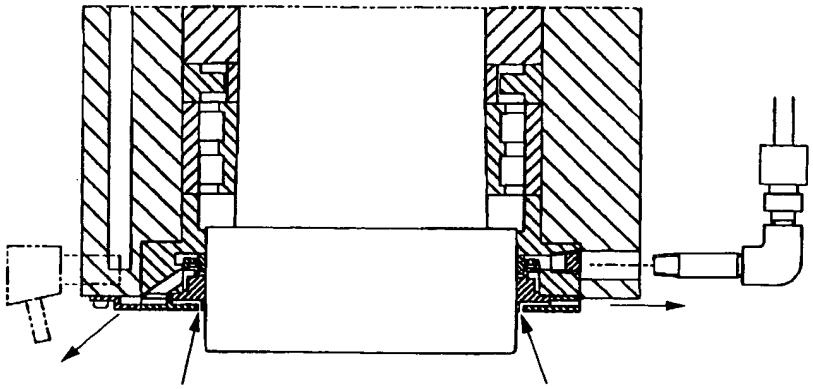


FIG. 117 (b)

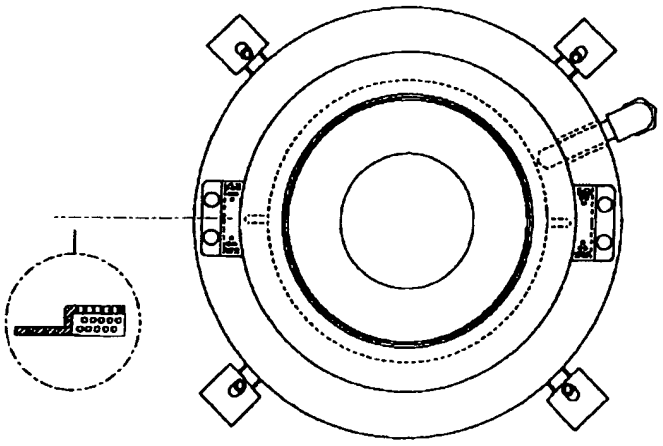


FIG. 118 (a)

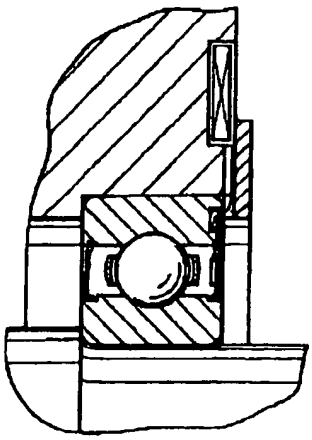
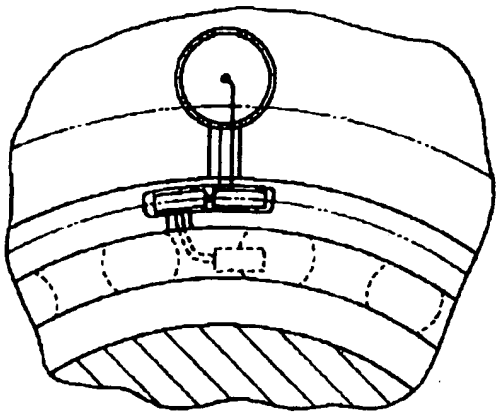


FIG. 118 (b)



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REPLACEMENT SHEET

FIG. 119

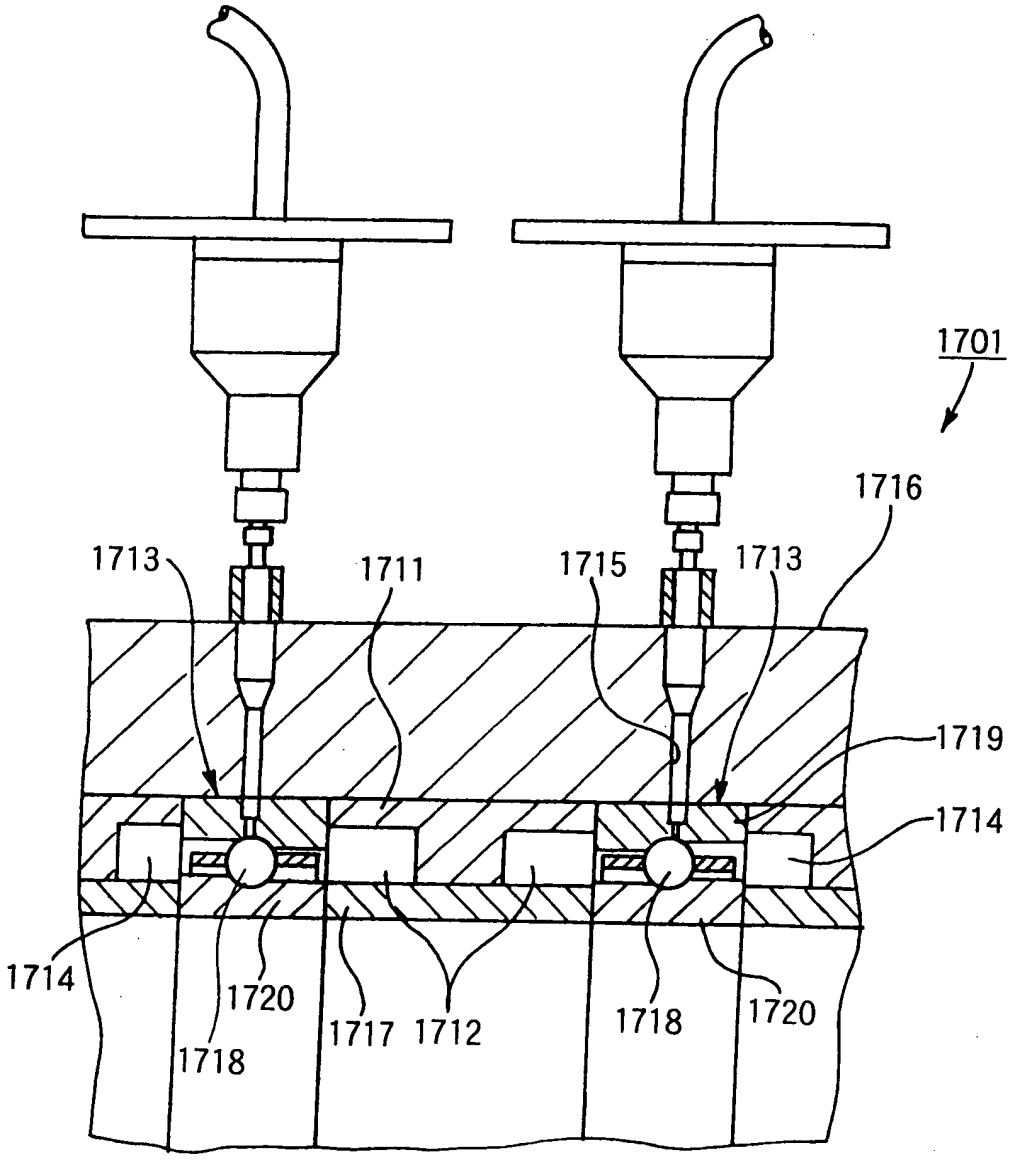

FIG. 120

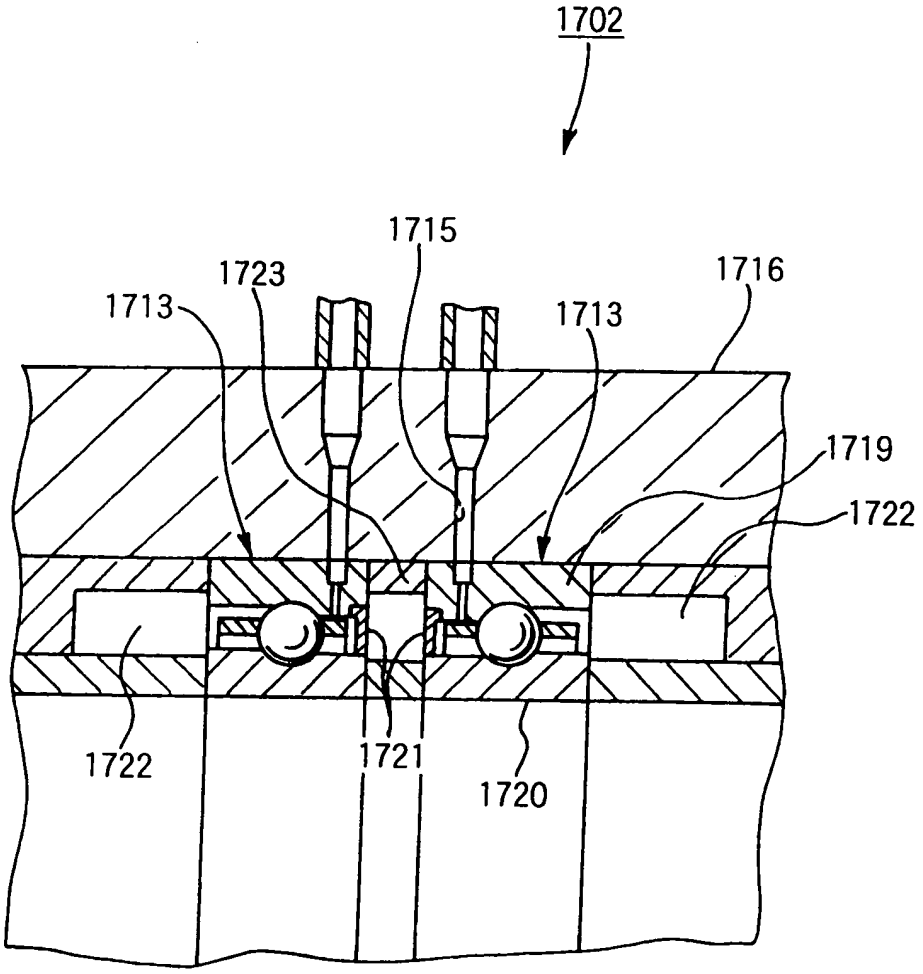

FIG. 121